Cycle

NOVEMBER 1974/**75 CENTS**

Impression: Norton-Triumph's High-Power Mystery Wankel!

Comparison: 10 Two-Stroke Silencers Face The Dyno

Basics: Filters

THE YAMAHA DT400B: DUAL-PURPOSE WONDER

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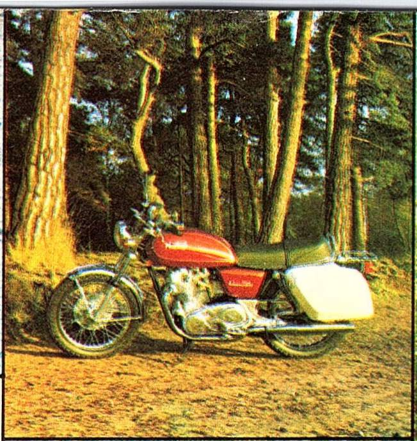

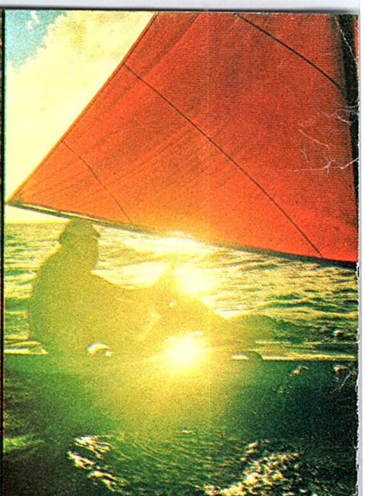

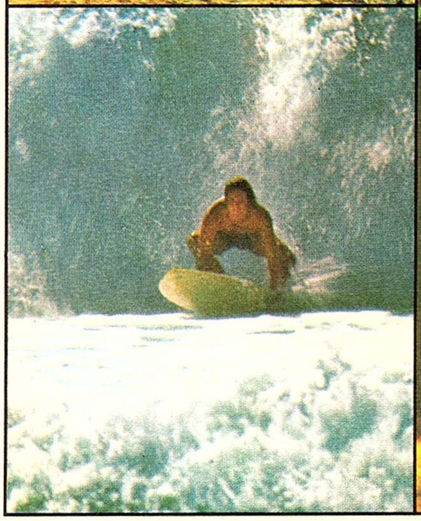

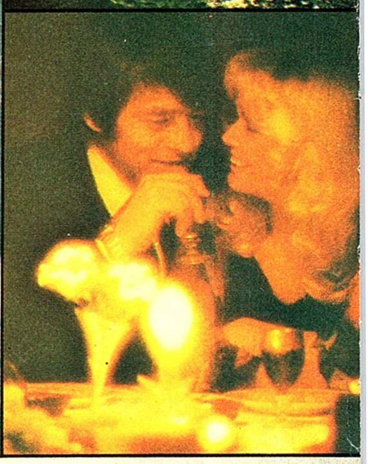

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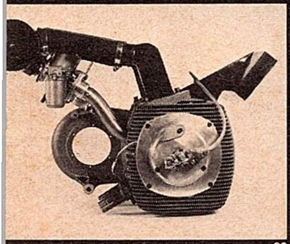
Cycle

November 1974 Volume XXV No. 11



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This Month's Cover: Yamaha has bid adieu to the venerable 360 enduro, and replaced it with the 400. The changes that have been made are unilaterally solid ones, and the new broad-bore is one of our sport's most pleasant, honest motorcycles.
Cover photography by Larry Willett.

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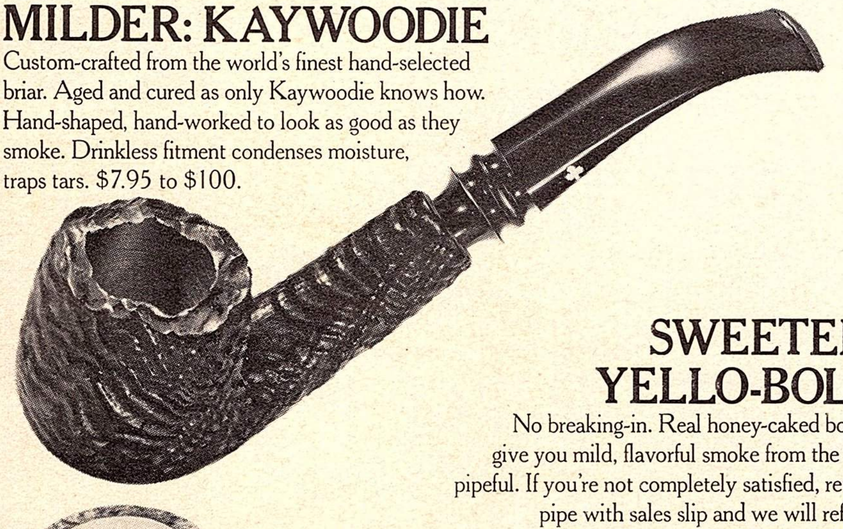

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KAYWOODIE/YELLO-BOLE/MEDICO
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(advertisement)

THE HONDA REPORT

November, 1974 HR #11

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The First of the 1975 Honda Motorcycles Now Available at Honda Dealers.

The first 1975 Honda motorcycle models are now in dealer showrooms across the country. Leading the list is the brand-new CB-500T. Featuring a 498cc twin-cylinder, DOHC engine with a five-speed transmission, the CB-500T brings a whole new idea in luxury to a medium-size bike. The paint treatment is unique – in metallic brown with gold pin striping. All Honda motorcycles for 1975 have new styling features and many engineering refinements designed for even safer riding. Another exciting bike coming soon is the Honda CB-400F. The CB-400F is powered by a 408cc four-stroke, four-cylinder OHC engine. It too spells luxury, with cafe racer styling touches and brilliant red or blue paint treatments. You can see the first of the new models at your Honda dealer's now.

38,000-Mile Bicentennial Celebration Journey on a Honda 450.

Riding a Honda CB-450 twin, Mrs. Mayra Scarborough, 58, of Nutley, New Jersey, recently established some kind of a record – she visited all 50 states on her motorcycle, in celebration of America's upcoming Bicentennial. Her journey's end came at the state capital of Hawaii, in Honolulu, where she raised an American flag which had once flown over the White House. It was the culmination of a 38,000-mile odyssey that took her to every state capital in the Union, where in every case the flag was raised over each state capitol building. Mrs. Scarborough and her Honda 450 – dubbed by her "The Wheeling Dervish" – began their journey three years ago after she became enthusiastic about the Bicentennial and wanted to do something in a personal way to commemorate it. Her 450 has given her 41,000 miles of dependable riding. She has now embarked on another trip, this time with a replica of the Betsy Ross flag.

Sammy Miller Captures 800th Trials Win on Honda TL-250.

The venerable Sammy Miller, who's really a legend in his own time, rode to his 800th trials victory on a Honda works TL-250 at the Somerset Motorcycle Club's Time and Observation Trials near Sparkford, England. Sammy's trials record is nothing short of phenomenal: in 1969, for example, he won 58 events – more than one victory a week! Sammy just keeps on winning – now on a Honda.

Attractive and Distinctive Hondaline Sweaters Now at Many Honda Dealers.

Hondaline™ just keeps on growing. The latest additions are rich, stylish sweaters knitted in 100% orlon. The sweaters bear the distinctive Honda name on them, plus a symbol of a bike and rider. In bright blue or red, the new Hondaline sweaters are offered in a variety of sizes to fit every member of the family. They're available at most Honda dealer's.

Honda trials motorcycles are designed for off-road use only.

CIRCLE NO. 26 ON READER SERVICE PAGE.

Editorial

Bias

● Those of you who accuse us of being narrow-minded, flighty, cynical, biased, sycophantic, wordy, Eastern Intellectual, unfair and reactionary are correct. We are all those things, chief among them biased. And I suspect that we may be justifiably accused of navel-staring as well, but in the interest of establishing a common battlefield for complaints let me rehearse what I construe to be *Cycle's* biases, its points of view and its feeling for the future.

We feel that American motorcycling has been invented by the Japanese manufacturers, and there is no doubt in our minds that their engineering, and their products, are the best in the universe for the largest conceivable number of motorcyclists. Their bikes generally reflect enormous investments of time, thought, money and chilly technical brilliance, their dealer networks and parts supply techniques make everyone else's (except Harley-Davidson's) seem weedy in comparison, and we wish they would make better shock absorbers. The Europeans are fueled more by passion than pragmatism, more by hope than business success and more by intuition than computer. We would like to see the Japanese do something frivolous, and the Europeans do something cold and relentlessly practical.

We lament the passing of the Superbike era. Certainly the motorcycles that evolve out of their rusty carcasses will be better machines for more people, but the Superbike era, initiated by Kawasaki's Blue Streak Mach 3 and presently sustained only by the 903 Z-1, was giddy while it lasted. Certainly the reasons for dropping the curtain on the firebreathers make sense, and it *is* true that the distance from here to there never was marked off in quarter-mile segments anyway. But still . . . but still.

Emission controls for motorcycles are coming, and 1976 looks to be the year. We believe that motorcyclists should do their share to protect the environment. We also believe that motorcycle engineers, like automotive engineers, will be unable to both adapt emissions equipment and maintain current levels of performance and rideability. So if you really want a neat, traditional, high-performance motorcycle, better get one in 1975. Because 1976 may be too late.

We love racing, we are inveterate hero worshippers and we believe that Kenny Roberts might be the greatest racer that ever lived. We think the Mile is the ultimate form of motorcycle competition, the half-mile is the most dangerous, and motocross the most physically demanding.

Our approach to road-test motorcycles is willfully cold-blooded. It is impossible, we feel, to evaluate for 425,000 different riders the value of charisma and sex appeal offered by a given two-wheeled specimen, and so we try (not altogether successfully) to avoid it, and concentrate instead on all aspects of engine and chassis performance, suspension effectiveness, civility, reliability and comfort. Bikes with a lot of charisma and little else do not do well in *Cycle*. We're sorry for that. Bikes with no charisma and acceptable performance do much better, and we're not sorry for that at all. Our concentration on performance has prompted several of you to write and tell us that we rely too heavily on the dynamometer. Possibly. But it tells us truths we could not otherwise discover, and truths in this business are to be cherished.

We believe anyone who does not wear a helmet is so brainless that he probably does not need one; we also believe that mandatory helmet laws are an affront to justice and profoundly unconstitutional.

We feel that motorcycle education and rider training is an absolute necessity, for several reasons. First, proper training *can* reduce injury and death. We are against injury and death. We are especially against injury and death to motorcyclists, who are our friends. Second, unless young motorcyclists do not stop killing themselves the Federal Government will feel obligated so to do, and that, if history can be of any value, would bring forth the apocalypse. We are for a constantly expanding motorcycle universe, as long as the expansion is orderly and progresses across a broad front. If motorcycle sales explode we would like to see a corresponding explosion in parts availability, trained service personnel, dealerships and off-road riding areas.

We would like the folks who push the buttons at the factories and distributorships to own, live with and ride at least one of their own products, pay for its maintenance and parts out of their own pockets, do business with their dealer face-to-face and get to know what the American motorcycling experience is really like, ingrown toenails and all.

We have confidence in the American Motorcycle Association. We know Ed Youngblood and we support him. We would wish that more did likewise, if for no other reason than to help the AMA help you. *But,* you tell me. *But* motorcyclists are loners. *But* the AMA has never done anything for *me*. Well, the more you act like loners the better your chances are of sinking like loners. Who will you blame then? The AMA? What AMA?

We do not believe on sum that the Great American Public considers all motorcyclists to be hoodlums and pervs. We believe that they tend to think ill of those who rattle their windows with Niagaras of exhaust noise, and we believe that they have that right. Noise, after all, continues to be our sport's largest public relations sore. You think you're guaranteed the right to blast all over the place making as much racket as you can? Nonsense. The other guy is guaranteed the right to watch his television or read his newspaper in peace, and if he rams your open expansion chamber up there where the sun don't shine, bless him.

But we think that for the AMA to mandate mufflers on roadracers is foolish—as long as motorcycles race on the same tracks that NASCAR, USAC, the NHRA and the SCCA use, how could it be that *our* noise is louder than *their* noise, or more frequent?

We know that in most accidents involving a motorcycle and an automobile, the automobile driver is at fault. We do not think he is at fault on purpose. He has not been trained to see motorcycles, and he will continue pulling away from stop signs and absorbing the unfortunate biker with the side of his car until such time as he is made more aware of us. That should come to pass . . . later.

We like cafe racers, enduros, touring bikes, motocrossers, all kinds of drag racers and Bonneville go-fasters, classics and restorations, speedway wigglers, dressers and stockers. We have never been able to understand choppers. Our loss, undoubtedly. Sidecars confuse us, show bikes delight us, Nortons amaze us and we hold out a certain amount of hope for Wankels. We fear that legislation in '76 will go hard on two-strokes, we wish someone would build a competitive, available four-stroke motocrosser and we hope the new 880cc, 60-degree Harley-Davidson doesn't vibrate. We'd like to be able to buy good gasoline, accessories that fit, parts that don't decimate our wallets, chains that last and tires likewise. We're for Baja and against drive-line snatch. We're too harsh with the lousy, too cynical about the mediocre and too lavish in our praise of what we consider outstanding. We think nearly all motorcycles have hopeless horns. If the Feds can control exhaust decibels, could they not control horn decibels as well?

As times change *Cycle's* biases will change. But these have grown comfortable, and I think we'll stick with them for a while longer.

—Cook Neilson

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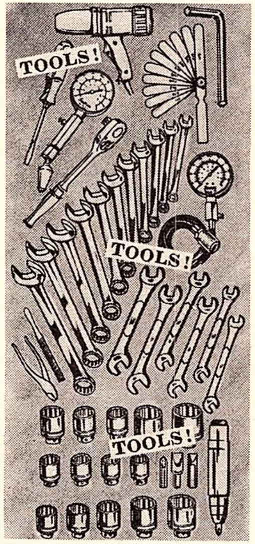
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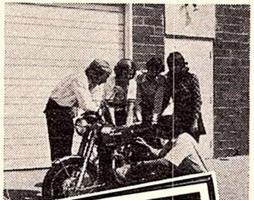

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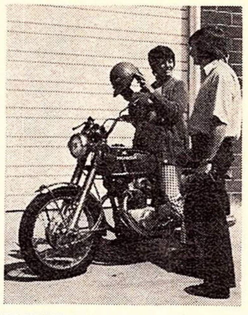

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Downhill Straight

In Fact, Not Deed

• We have just launched an experiment involving the pastime of privateer motorcycle racing, publishing and the space/time continuum. We are sure you will be pleased to learn that no two of the three are operable simultaneously; and that two, namely racing and publishing, are not operable even separately.

It was the aim of the study to prove the so-called Lead-Time Theory. In order to understand the Lead-Time Theory, as applied to privateer (although not necessarily exclusively privateer) racing, it is necessary to understand Lead-Time.

More precisely, Lead-Time is the very short time it takes to get the next magazine ready to appear on the newsstand. Or, it can be the very long time between the event about which a reader wants to read and the time it actually appears in the magazine at the newsstand. It depends whether you are a reader or writer.

Now that you understand what Lead-Time is, we can go on.

Next, we must sketch out the concept (mind you, concept, not fact) of Privateer Racing. The very combination of these two words, in the estimation of many among the knowledgeable, simply negates the whole thing. Team Stupid to the contrary. As usual. No matter what the experts say, Privateer Racing does exist; nevertheless any expert will tell you that it isn't very successful. That it *does* exist, and that there are those who would have it succeed in the end, is sufficient ground for the experiment.

"Sufficient ground" is perhaps an understatement. It is the very motivation for the experiment. It was all that talk about the impossibility of private racing efforts that was at the very heart of the idea. There is nothing more disappointing to hear than a former privateer holding forth on the failure of privateer racing. It is even more disappointing to hear if you are a current, practicing privateer.

It can be pretty rough, admittedly, out there on your own. No big factory to take care of everything. Not even a big dealer to help. Just you and your meager resources against the big guys. And you know the odds are against you, but they *are* odds, and there are two sides to odds.

So every time you read about some rider or another who went out and whipped the factory mounts you get a little rush—a warm feeling over, and you are encouraged to go out there and try it some more. Except that your ol' pal, the former privateer, keeps buzzing.

"Be smart, like me," he tells you. "Get out of it now, before you waste your youth."

You know your youth was wasted a long time ago so that is no reason to get out of racing. "I'll waste my youth my way," you tell him, and remind him about Joe X who won the Bell System Ding-a-ling Indoor Short-track Trophy last week at Altoona. A privateer, so there.

"That event could have been staged in a telephone booth," scoffs your ol' pal. It was, but you won't admit it. It was a privateer win. Period. With chin high and renewed resolve you plod onward and upward toward your unshakeable goal.

Well, some do. They are the ones you hear about. The young, undaunted losers who struggle against seemingly overwhelming odds to finally become old undaunted losers. The dropouts, on the other hand, are usually fated to fritter away their lives at successful careers in commerce and industry, like being the Executive Vice President of a duck farm.

Anyway, now you have a grasp of two of the elements of our experiment: Lead-Time and Privateer Racing. Thus we come to the Space-Time Continuum, or STC. Before trying to say *why* this is a factor in our study, we will first try to tell *what* it is.

In the Einsteinian Relativity, physical space consists of the ordinary three spatial dimensions, plus a Fourth Dimension: Time. It is then referred to as a Space Time Continuum. We use this system, in a way, when we say "I'll be in my office on the third floor of the building at 5th and Main at three o'clock." We haven't gotten to it yet, but this is not far from what is known as "Being In The Right Place At The Right Time." If you have got all this down pat now, we can continue. Otherwise you will have to go back and read it over until you think you've latched onto the whole valise. We'll wait.

Okay. That takes care of all the basics.

As long-time readers of this column already know, this is about the time of the year to start getting ready for the greatest of all of the International Classic races, The Daytona 200 (plus or minus a few miles). This is usually a painful procedure, accompanied by much hissing and moaning, since this is the time of year given over to Giving Thanks for whatever one thinks one has Thanks to Give. There is that whole business about the season tickets to the football games that began back in July. There is all that wondering about Aunt Flossie. Like is she going to show up unannounced at your door, drunk as a Lord, this month sometime? She did last year, and you had to put up with her. And next month brings all those other little things. So, it's a bad time to try to get ready for Daytona. But a start has to be made.

This means that you have to ignore all of your responsibilities, and it is this realization, rather than the overwhelming odds facing the privateer, that in the end totally discourages him. With any sort of luck at all, the new Team Stupid System of Privateer Racing Utilizing the Space/Lead-Time Continuum will solve all the problems.

What could be solved by our new approach is that whole put-down-the-privateer bag. A few good wins and then none of the ol' pals would dare come around with their outrageous insults upon the solo industriae.

It is not known to most of the public, but there is a Black Hole in the Press Cosmos, caused mostly by the Lead-Time Factor. What happens is that once the story goes into production nothing else can change it. And nobody ever reads the corrections. There's no way to alter the results. Which is why journalists are so careful to begin with. They all know this. So here's the way we will put it to the test.

While the 250 is underway at Daytona the Team Stupid bike will be wheeled into the winner's circle. Two other machines will accompany the pig, so things should look right. We will have a beauty queen on hand to kiss the winner. Naturally. We will have a couple of bottles of champagne for the drinking and the pouring on the head and such like stuff. A wreath of something appropriate will be on hand to garland the lucky fellow. The winner's circle at Daytona is a cyclone-fence-enclosed space. Once the race is over and the reporters are in . . . we lock it up. We let them take our pictures. We grant lots of interviews. The reporters run off to file their stories. The Lead-Time has begun. We . . . We . . . Team Stupid . . . have Been In The Right Place At The Right Time. The Black Hole of the Press Cosmos will close around us. In the Space/Lead Time Continuum that exists we will have won the race! Only those who watched the contest will know, and even they will be confused. And maybe it will really work. Really . . . like in science fiction, or the Journal of the Atomic Sciences . . . or maybe the Wizard of Odds . . . Stay tuned until . . . the middle of May . . . maybe June . . . and see how the Daytona report comes out.

Watch for the big break-thru. Factories: Kiss your airs goodbye! . . . Conceptual racing is taking over!! It's scientific . . . Abstract . . .

—Mike Shuter

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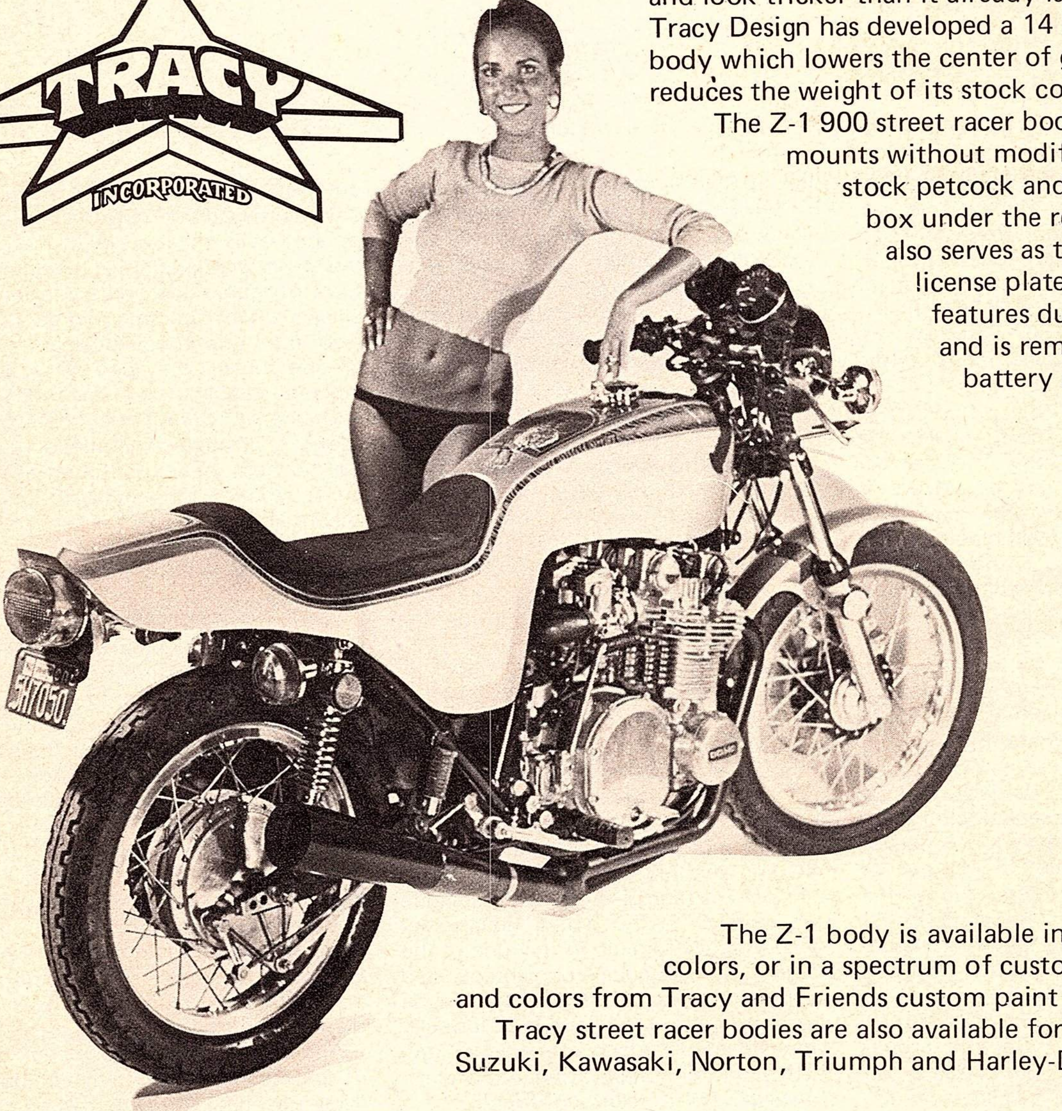

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CIRCLE NO. 36 ON READER SERVICE PAGE.

Pipeline

To Change, Or . . .

• *The Story So Far:* Spurred on by BSA-Triumph and in league with the American Motorcycle Association, Britain's Auto-Cycle Union requested Federation Internationale Motocycliste recognition for American-style roadracing in 1971 which, known as Formula 750, would be the AMA's initial contribution to its newly-forged alliance with the FIM.

The FIM responded but with no great enthusiam, placing F750 alongside the myriad other international formulae for promoters, sponsors and organizers to consider in connection with their 1972 plans. Barely distinguishable from the established AMA Class C rules, the concept of a production-based formula (outside of "Sports-Production Machines") was a startling fresh innovation in Europe. Too innovative, in fact, for immediate assimilation. Only the ACU pre-empted the official international launching with a hurriedly assembled National Formula 750 three-lapper (113.19 miles) added to the 1971 TT program. The race went to Tony Jefferies, riding a Triumph triple of the then all-conquering Beezumph breed.

Throughout 1972, F750-Europe remained embryonic. The organizers of the Imola 200 ("The Daytona of Europe") chose a middle path, enticing Italian manufacturers into 750cc racing through a 501–750cc ruling—thereby outlawing the hated 350 Yamahas. The ACU naturally promoted another pure and proper F750 event, run over 188.65 miles of the TT circuit, which produced another victory for Triumph through Ray Pickrell. Otherwise, and in other places, F750 went begging for acceptance. But later that year, the FIM announced a second-tier championship series *(Prix FIM de Formule 750)* to be slotted into the international calendar overload as and when interested parties might find it convenient.

Seven rounds constituted the 1973 F750 championships, with Italy, France, Sweden, Finland, W. Germany, Britain and Spain staging the meetings. Ironically, no American race graced the series, since the original intention of including Ontario was junked during the period of uncertainty over the circuit's future. Anyway, the European-staged championship went ahead, and duly produced a champion in Barry Sheene of Suzuki-GB. Of the European manufacturers, only Norton Villiers paid more than lip-service to F750, contesting most of the rounds and ducking only those which clashed with Ontario and Laguna Seca. MV-Agusta, committed to all-out Grand Prix war with Yamaha, ignored F750. And Ducati concentrated on big 860cc desmo twins in long-distances, anything-goes (production, prototypes, racers-with-lights) events.

In 1974, the FIM declared the TZ750 Yamaha illegal for F750 competition, effectively committing the formula to an early grave. Promoters of F750 championship rounds promptly discovered the merits of Formula-Open (Formula 750 as written, *plus* TZ750s, as though the FIM never existed).

In June this year, at the instigation of Norton Triumph, representatives of the manufacturers met in London to discuss ways and means of resuscitating F750. Their deliberations boiled down to a decision that the F750 production requirement should be reduced from 200 to 25, applied solely to engines and transmissions, thus retaining the original production-based spirit of F750 (and giving some semblance of credibility to the quaint notion that you'd actually be able to *buy* one of the 25 engines in identical condition as used by the factory teams). The FIM would be pressed to adopt this new-look formula, which boasted backing from the AMA, the ACU, Norton-Triumph, Yamaha, Suzuki, Kawasaki, MV-Agusta and Ducati.

There followed strident, and somewhat inebriated demands for a restructured one-class international roadracing series to produce a single world champion.

For the benefit of those to whom FIM racing remains a dark mystery, I will point out that the FIM "world championship classics" consist of more than a single class. Including one for 500cc sidecar outfits, there are six theoretically-equal world championship classes, producing six world roadracing champions. Many people rage at this multiplicity of champions/championships, accusing the FIM of deliberately devaluing every champion for the sake of keeping minor member states and obscure manufacturers happy. How on earth, they ask, can equality of prestige between *50cc* and *500cc* possibly be envisaged? Others reply that a slight loss of egotism is unimportant to the good of the sport; what matters is the unmatched feast of roadracing present in the multi-class system. Spectators in general stay aloof from unproductive argument. After all, the race(s) they see, as of a given moment, simply grab or fail to grab their enthusiasm. Computing championship scores to arrange a hypothetical situation for the next or next-but-one meeting is an occupation for pundits to indulge at leisure. The success of a day's racing is judged by spectators in terms of the presence of the aces and the closeness of the action.

Let's consider how the action unfolded for the benefit (or otherwise) of 125,000 cash customers at the Dutch TT (Grand Prix): The Dutch featured the maximum six classes in races lasting approximately 50 minutes, except for the 50cc which has a 22-minute duration. Accordingly, the number of 4.78-mile laps varied; 9 for the fifties, 14 for the 125's and sidecars, and 16 for the 250, 350 and 500cc.

Assen's demanding mix of slow corners and super-fast sweepers restricted average speeds. Horsepower plainly played a relatively minor role: the winning 250 averaged 91.21 mph, compared with the 350's 92.65 mph and 93.95 mph for the five-hundred.

And the action? Briefly, as follows. *50cc:* Dull for the uncommitted, but positively upsetting the Dutch when Herbert Ritterger from West Germany on a Kreidler stuffed it to the local talent. *350cc:* Won by Giacomo Agostini (Yamaha), taking an early lead and sticking with it, while Tepi Lansivuori, John Dodds and Patrick Pons battled behind. But Dodds ran into brake fade, Lansivuori's frame fractured, and Dieter Braun passed Pons and Billie Nelson to snick into second at the flag, where the Yamahas were in possession of 18 in the top 20 places. *250cc:* A US-Euro dispute, Walter Villa (HD) leading, Ken Roberts (Yamaha) harrying all through six laps. Roberts tries the out-scratching ploy, and slides to asphalt but then gets reunited with damaged Yamaha and finishes third.

(Continued on page 12)

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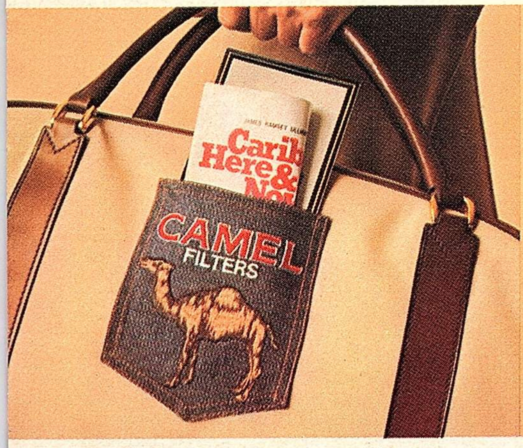

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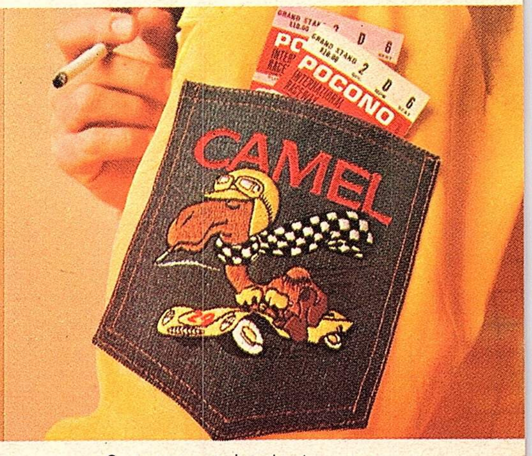

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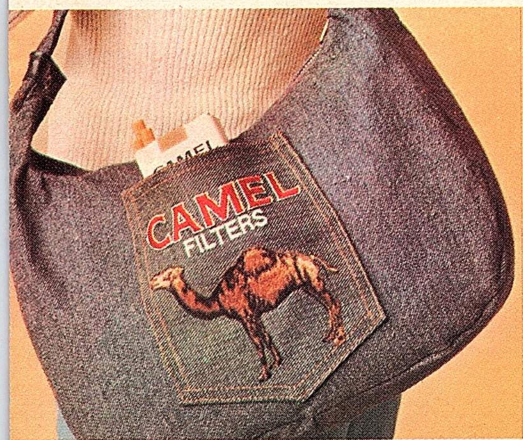

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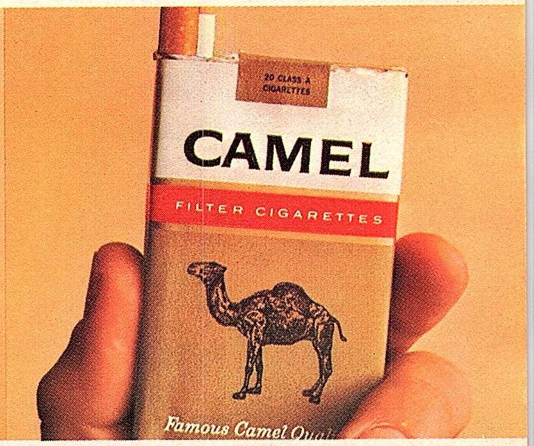

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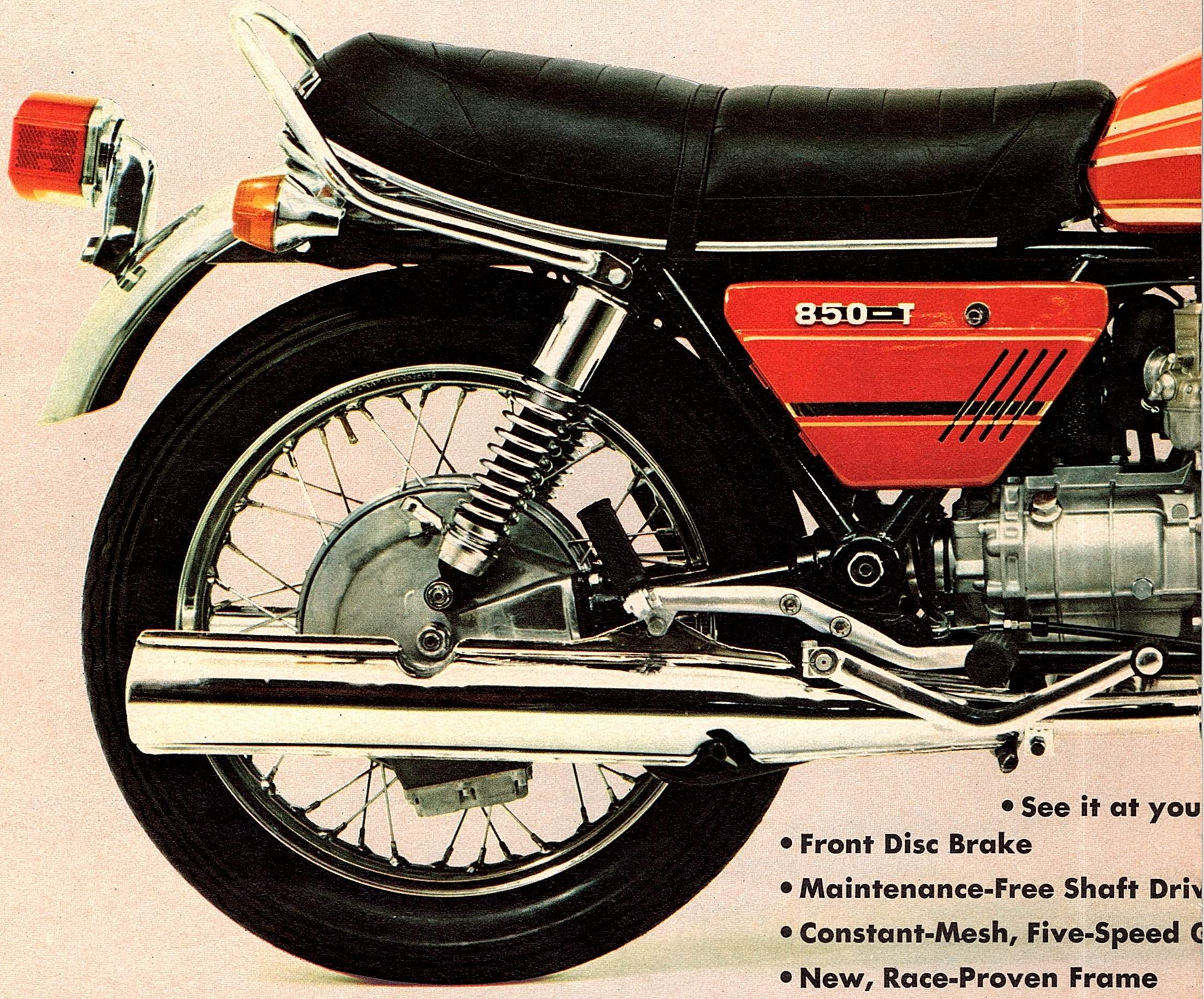

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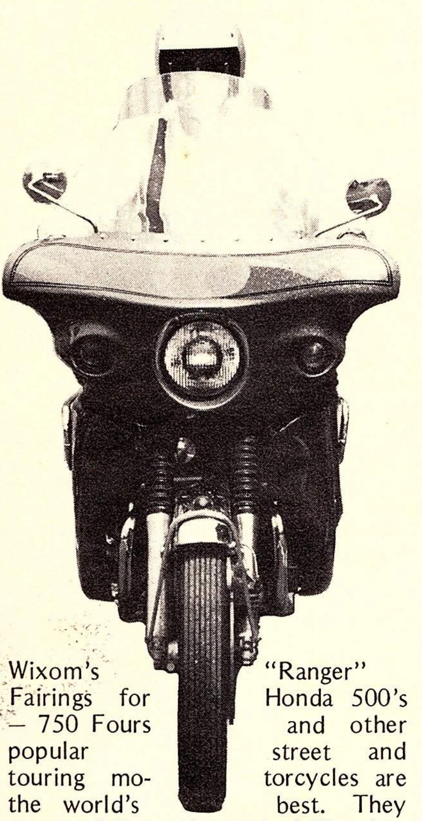

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MIC

CIRCLE NO. 41 ON READER SERVICE PAGE.

PIPELINE

Continued from page 8

Roberts sets lap record in 3m 5.8s (92.77 mph). *125cc:* Record breaking bent, Angel Nieto (Derbi) scrapped with Bruno Kneubuhler (Yamaha) and Paolo Pileri (Morbidelli). Before the Derbi's rings disintegrated, Nieto lapped in 3m 13.5s (89.04 mph), cracking Bill Ivy's way-back figure set on a works Disc-valve Yamaha "four" in 1967. Kneubuhler finished first, Ottello Buscherini second on a Malanca twin (yessir, they have variety in 125 racing). *500cc:* The big boys are at it. Phil Read pace-setting, chased by Ago, Lansivuori and Gianfranco Bonera—the exotic works MVs and Yamahas in full flow. Ago's due for a down, it seems, as Read goes five seconds clear on lap five. Not so. The MV suffers an attack of vibes, and the handling deteriorates. Ago Yams ahead, and breaks so many records that people quit counting. *Sidecars:* Klaus Enders (Busch-BMW) comfortably, after being given a rough passage by Werner Schwarzel (Konig). Schwarzel pits to repair dud clutch. Enders breaks lap record—3m 21.2s-85.61 mph.

The 125000 judged it a day of supreme entertainment; a feast of roadracing fit for the connoisseur. The question is, would they willingly trade the traditional European style of race programming for meetings almost totally devoted to a single contest between 30–40 riders? And could European organizers be swung into voluntarily abandoning their money-spinning multi-race promotions for the uncertainties of one- or two-race meetings?

The questions are important because of the radical change implicit in the single championship (Formula One?) suggestion. In no way can "F1" be accommodated without tremendous impact on FIM racing as it now is practiced. Simply looking for glorious improvement and ignoring the need for altering one's set ways cannot be entertained as a viable proposition.

Paradoxically, FL's strongest supporters appear most reluctant to accept that the whole basis of European racing must change. "Formula One" and all the traditional capacity classes, they maintain, can co-exist. But the whole tenor of their demands proves the opposite. For barely concealed beneath their clamor for an exclusive world champion lurks an obsession with the amount of publicity, prestige and sponsorship accorded to Formula One *automobile* racing. It's no secret really; the presumption that simply following the cars will bring a massive inflow of sponsor's money to motorcycle sport is the platform for "F1" propagandists. In which case, a system must evolve to guarantee 100-percent concentration on the single ("F1") issue. No fringe racing activities can be allowed to dilute the prestige of *the* race. If a championship race was to be supported by preliminary events for all the usual capacity classes, confusion would result, especially if the title contenders raced in the minor events. Then confusion might turn into embarrassment if the back-up affairs proved bigger and better in the thrills and entertainment departments. Restricting the program-fillers to juniors, novices and what have you conceivably could result in some highly disconcerting glory-grabbing by the understars, unless the support races were so short to be meaningless.

The alternative is plain: a single championship race of considerable mileage, 150–200 say, uncluttered by side issues. If not a continuous 200-miler, then a split "200" after the styles of Ontario and Imola. Or, as the minimum requirement, two legs of around 75 miles apiece.

Obviously, championship exclusiveness would clamp an elegibility squeeze on the number of competitors who could be accommodated; maybe a fixed number of 30 to 35, assuredly reserving the championship for the world's top aces. Openings into the top grade would be hard earned, possibly through manufacturers' recommendations or by screening at national levels. Another method worth considering is to accept 90 entries from which a grid of 45 is selected on practice times, leaving the non-qualifiers to dispute a fill-in race during the interval. Or, to maintain the strictest selectivity, find 30 to 40 through a series of qualifying heats (roughly the AMA pattern); the ten losers being shunted away to the sidelines for the race—and better luck next time. The autonomous process would be completed by banning any other solo racing on the day. In Europe at any rate, this could open the way to sidecars gaining an enhanced status—albeit losing their "world" championship.

The intended exclusiveness has other implications. As a first essential, the FIM should be required to prune the number of classic meetings and, in the process of minimizing the age-old concentration of "world championships" into the Continent of Europe, offer America a date (assuming a Formula One to suit the AMA's taste). Moreover, farther-flung parts of the globe could bear further investigation.

Accepting that sport is inseparable from commercialism, the criterion for allocating championship sanctions becomes organizing ability, depth of purse, and the approval of multinationals bearing the financial burdens (presuming a rush of sponsors). Handing over effective control to remote promotional managers may seem a heavy price to pay, but you've probably noticed that sponsors soon cease being servants and become gods.

But all of this, I reckon, is purely academic, since the manufacturers' latest F750 propositions is united with the demand for a single championship set-up. (25 units-equals-Formula 750-equals Formula One.) You can bet the majority of European FIM members will consider the package too much for swallowing in one go. In isolation, the F750 re-write stands an even chance of getting the nod. The F750/F1/champion-of-champions conglomerate is a certainty for the block. There's a chance, of course, we'll finish up seeing *seven* world championships.◉

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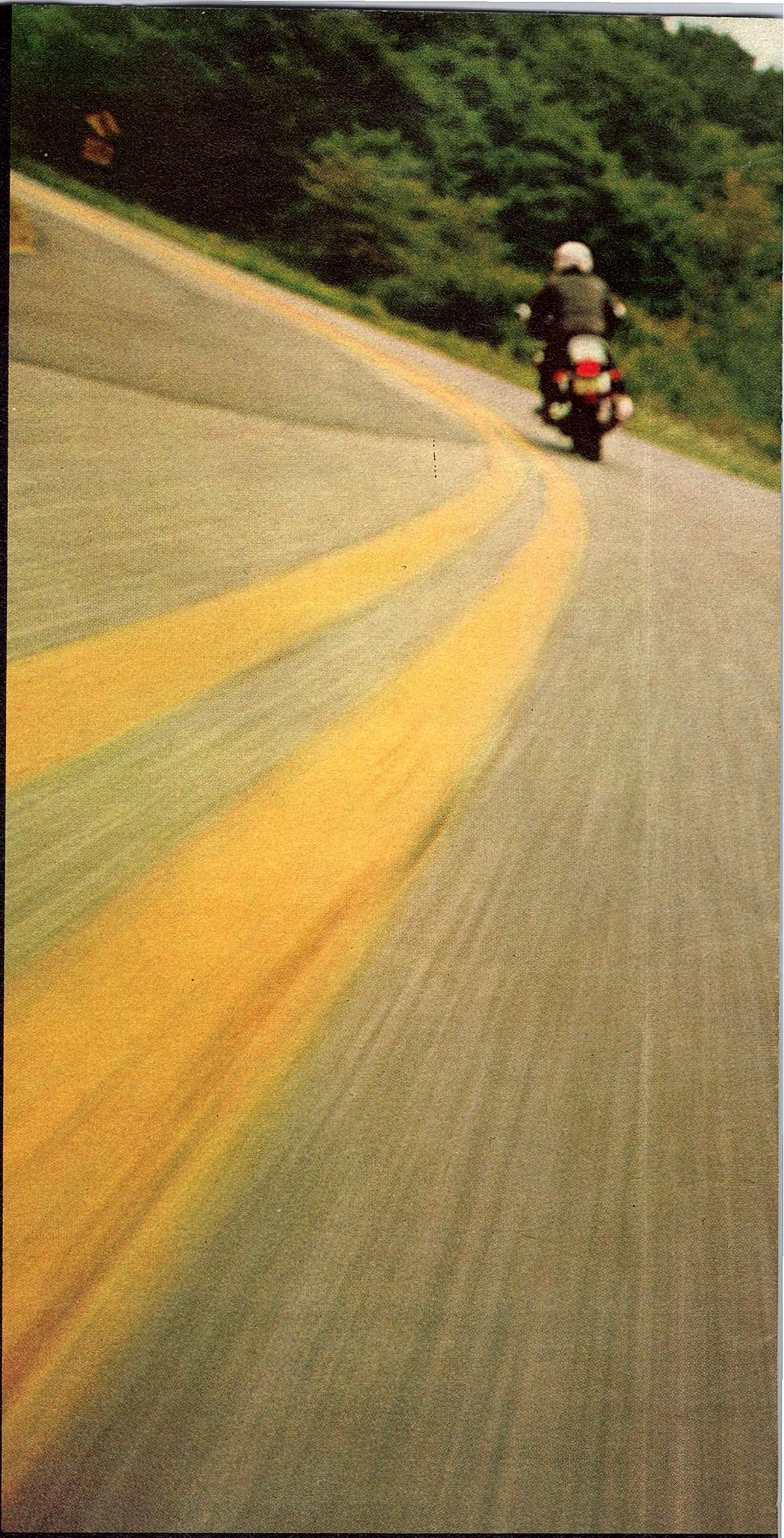
CIRCLE NO. 23 ON READER SERVICE PAGE.



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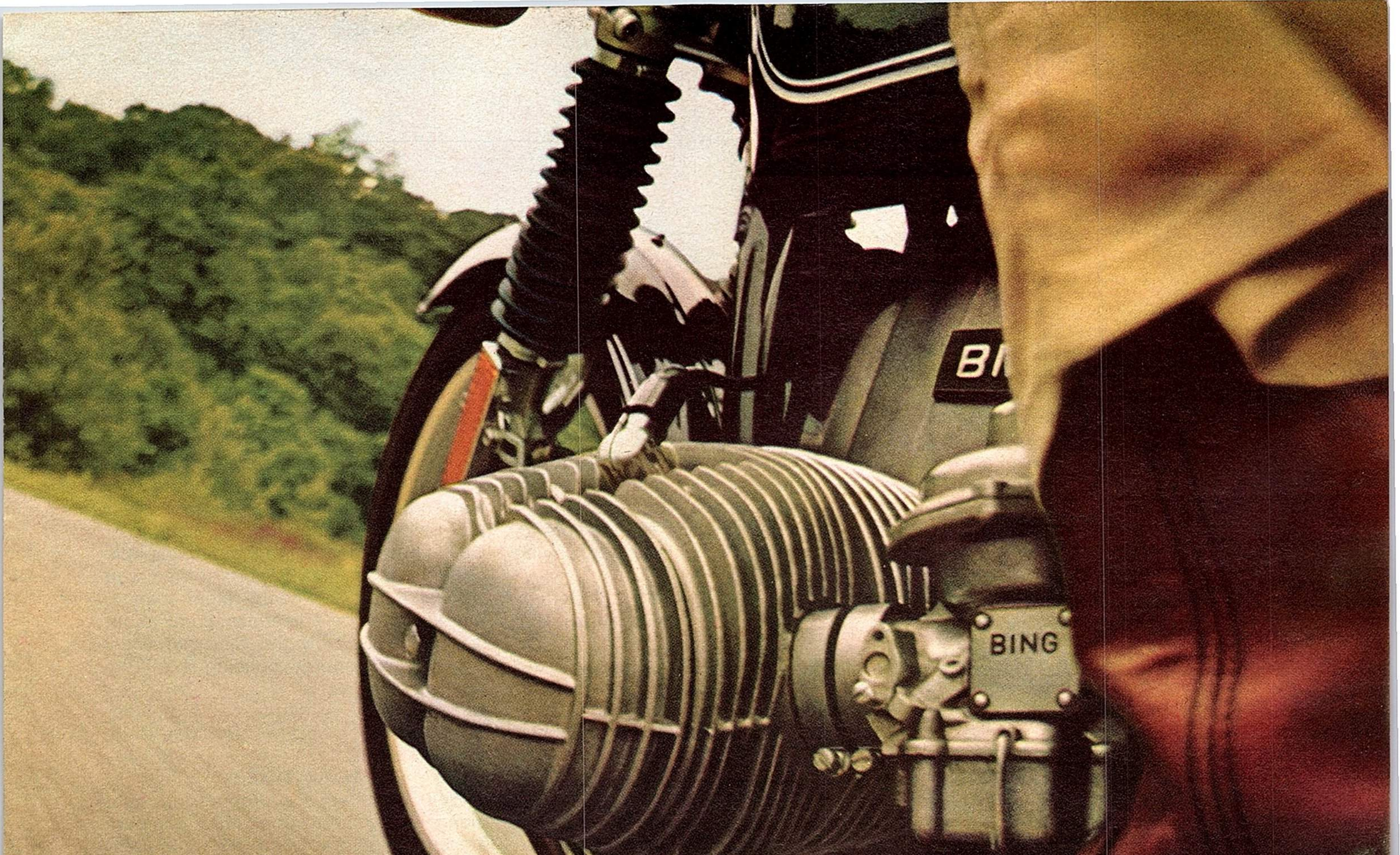

Placing the engine across the frame has another advantage. It allows us to run a driveshaft out of the back of the gearbox, a sealed-in-oil drive-shaft that is trouble-free. (And you know all the problems you can have with a chain.)

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Letters

Smooth—Not Rough

I have a 1973 Honda ST-90. My brother and I ride it at a school parking lot. We're getting bored of it too. We know about an old abandoned railroad bed that's right on our street, but my dad isn't so keen on letting me ride there. It's not a rough trail at all, and I feel my 90cc could take it. Please HELP!!

Tommy Guerrant
Chester, Virginia

Tell your Dad we said it was OK.—Ed.

EARL'S COLD

I have just read the article on Visalia and I must say that it left me cold. I expected more than East Village-type coverage.

I thought my interest was blurring my mind about other aspects of being an enthusiast until yesterday. A fellow rider and accomplished dirt racer took my Ariel single for a ride. When he came back his simple statement sums it all up, "If this is the way twenty year old singles handled, then heaven help the new riders that think a Z-1 is a handler." I ride a 1972 BMW for my long trips and while I love its reliable drive train I know my Goldstar is much less likely to dump me on my head at high speed. I experienced a full length frame wobble at 90+ with my Honda 750 K1. This was in the really deserted part of Nova Scotia and there were no contributing factors such as wind gusts from trucks, etc. The bike was new and checked out before and after the trip. I no longer ride Japanese bikes at high speed no matter how much the mags praise the engineering breakthroughs etc. Sure, old bikes had handling problems but when you waded through all the tales there was always a reason, as opposed to tinsel-town oriental specials that fortunately are not aging well.

This all seems to have wound up as a defense of my hobby, but I still think your article stinks.

Earl Symonds
Yonkers, N.Y.

CAST OUT

In regard to your recent article "The Twelve Cylinder Express," I wish to inform you of an error. On pages 27 and 31 the term "Centrifugal Force" was used. The usage of this term, however, is incorrect. The myth of centrifugal force has been cast out in physics classes due to recent experimentation.

The motion of an object away from the center of the circle is caused because an object will travel in a straight line unless some force acts upon it; or, as I was taught, the object moves tangential to the arc of the circle unless a centripetal (center-seeking) force holds the object to the course of the circle. The "Slipper Clutch" works on the principle of tangential velocity and not on centrifugal force.

Centrifugal force, as described by my excellent physics teacher, is unequivocally dead. Its misusage is wide-spread, stretching even to state-issued driving manuals.

James O'Connor
Morristown, N.J.

Now lissen Hear, Mr O'Conner. If the werd is Yewsed in stait-issewed drivin manuel's, which Oui all know to be Guiding Lites of correkt Inglish Usige, then the werd must be awl right.—Ed.

ENDUROISM

In regards to the August '74 issue, in the article "Keeping Time" by Ron Schneiders he mentions two places in which to get enduro accessories, Motorcycle City and N-Duro Specialties but did not give the complete addresses. Would you please give them to me?

Doug McBournie
Delmar, N.Y.

Sure. Motorcycle City is located at 224 N. A Street, Lompoc, Calif. 93436, and N-Duro resides at PO Box 212, Mauldin, South Carolina 29662.—Ed.

ITALIAN KAWASAKI

Just a short note in response to Mike Davis lengthy pro-Vespa tirade; which was aimed at Ron Wiggins' anti-Vespa tirade . . . (sorry to say I missed Ron's).

Hey Mike! Did you know that Vespa comes to us from an outfit called Piaggio? It's true. Yes sir, they make cars (Fiat & Ferrari), boats, planes, even motorcycles. Sort of the Italian version of Kawasaki.

In fact, the mighty Vespa powerplant was designed as a starter motor for the WWII German Jets. At least that's the way the story was related to me . . .

At any rate, I must digress. The original point of this letter was to inform Mike that I once owned a Piaggio *motorcycle.* No, it didn't say Vespa on the tank, but it did say Gilera. Most of them sold in this country, however, said Sears on the aforementioned fuel tank. Therein lay the problem. Although the 106cc 4 stroke single was a trusty beast, parts weren't available. And let's face it, machinery breaks.

Now to drag out the old soap box. Western Scooter Distributors (Piaggio dist.) will hopefully learn from Sears' mistakes when they re-introduce the Gilera to America next year. Sears couldn't even stock parts for Vespa, let alone Puch or Gilera. Unit sales are meaningless unless they stay on the road.

Then there's the story about these three guys in red, white & blue t-shirts who started a free-for-all over whose scooter was best—the Harley topper, Mustang or Cushman. The moral of that famous epic struggle is far more important than who won: if it has 2 wheels rather than 4, there's gotta be something good about it, even if it's only the fact that you'll expend less energy pushing it off the nearest cliff.

A friendly cable replacer
Boulder, Colo.

HARD TIMES

Well, here we are progressing right along in the 20th century. All our cars are becoming lower and lower compression. Soon they'll have no compression at all. But what about motorcycles? A motorcycle is a HIGH compression engine and I tried lead free gas and it makes my motorcycle run like BEEP. So what will become of the MOTORCYCLE? Will it become an ancient word for the bike that used to run? I'm waiting just like many others to see what the Japanese pull out of their trick hat. Ten to one says its a DOG!!!

Kevin Derabasse
Bedford, PA.

DISGUSTED

I have just finished reading a letter in your September 1974 issue entitled, "Quiet Zone." In the letter Mr. Taylor pointed out his dislike of motorcycles with loud exhausts.

Mr. Taylor should be happy he has a quiet cycle. I have owned a CB500 Honda for 7 months now. During these 7 months the mufflers have been eaten up by rust and the cycle is now *very noisy.* Although I enjoy this bike very much I am disgusted to think that Honda could put such a cheap and poorly-designed muffler on such a beautiful machine.

Don't worry about the noise, after several months of complaining to local dealers and several calls to California, the mufflers will soon be replaced by warranty. The only worry I have now is how long it will be before my replacements are rusted-out.

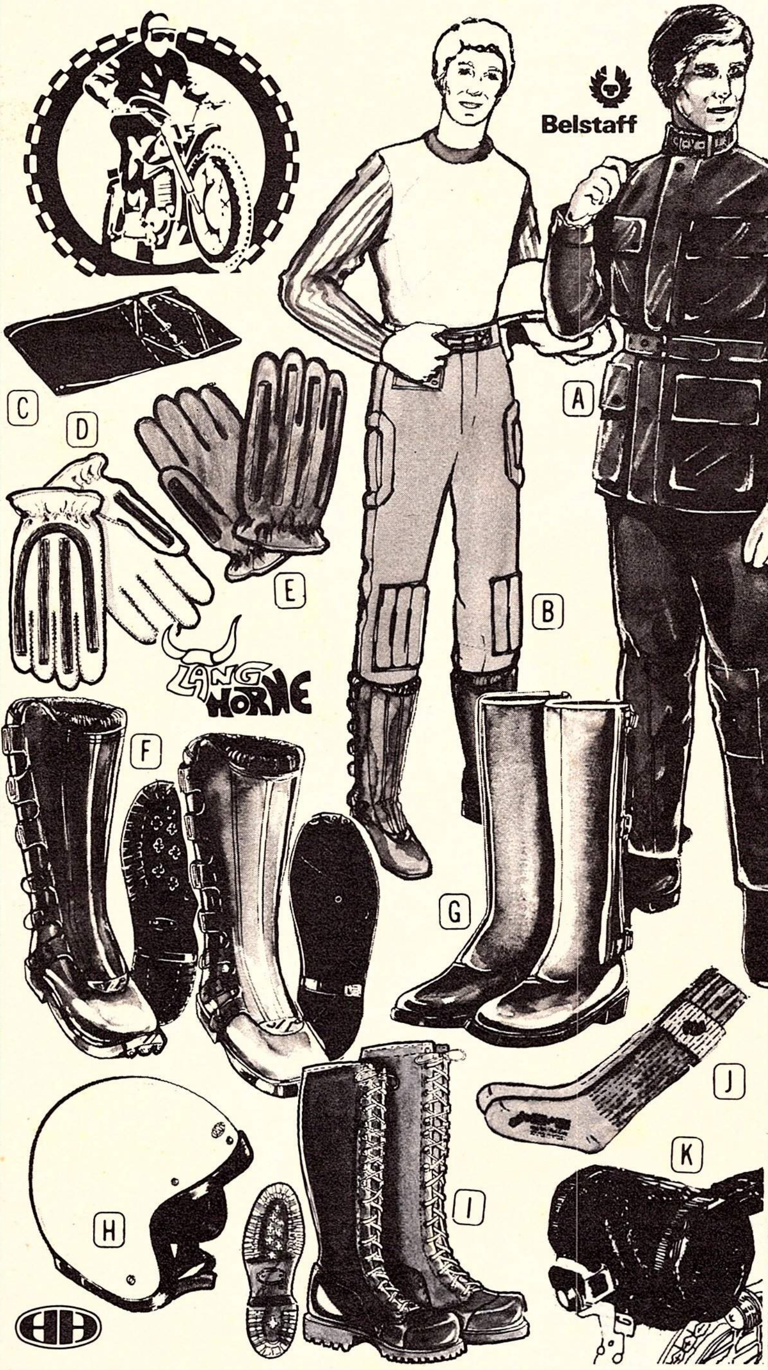
I hope not for a long time, because I also enjoy a QUIET MOTORCYCLE.

Thomas A. Lee
Oak Ridge, Tenn.

(Continued on page 105)

THE OUTRIDER

FOR MAN AND HIS MACHINE



A. TRIALMASTER "PRO" JACKET—The ultimate jacket for trials or enduro riding in heavy duty, 100% waterproof, waxed cotton. Double stitched seams and reinforced patches on shoulders and elbows assure long life. Stand up collar closes with adjustable strap and buckle fastening. Rust proof zipper front closing with snap fastened overflap. Four large pouch pockets, foul-weather proof covered by snap fastened flaps. Sleeves have gusseted cuffs with adjustable snap fastened closing. Underarm gussets are ventilated. Lined with cotton fabric. Black, red, green. Sizes 34, 36, 38, 40, 42, 44, 46, 48. $73.75

TRIALMASTER "PRO" TROUSERS—Matching pants for Trialmaster "Pro" jacket in absolutely waterproof waxed cotton. Waistband is elastic and zippered access openings to under pants pockets are provided. Ankle openings are gusseted with snap fastened tabs and adjustable strap and buckle at the cuff. Seat, knees and inside legs have reinforced patches for extra long wear. Cotton fabric lined. Sizes indicated are inseam length measurement. Black, red, green. Sizes 29", 31", 33". $51.00

B. "DYNAMITE" DENIMS—Denims for motocross, enduros, trial riding, etc. Reinforced by sewn on belt, pads at knees and thighs, with a heavy duty buckle, choice of red or yellow racing stripes. Great for gals, too. Order by waist size.

Boys sizes 22"–28"	$19.95
Regular sizes 30"–38"	$21.00

C. ELASTIC KIDNEY BELT Provides excellent abdominal support in rough competition riding. Stretchable elastic with verticle spring-steel stays. Closed by snaps. Black. Sizes 28, 30, 32, 34, 36, 38. $8.50

D. MOTO-X GLOVES—Specially designed and manufactured with seamless, one piece palm construction of tough, supple leather for moto-x or enduro competition. Rubber strips protect knuckles from bruising by branches, stones or other objects. Snug fitting elastic cuffs. Specify size: S, M, L, XL. $9.95

E. ENDURO-TRIALS GLOVES—Attractive enough for street wear, warm enough for long trail rides, sensitive feel for trials, protective ribbing for protection in enduros—this glove is the best all-round glove we've seen. Top grade cowhide, one-piece palm, rubber finger and thumb ribbing *under* surface of leather, fully lined. Available in black or brown. Sizes S, M, L, XL. $9.95

F. SIX DAYS BOOTS—All features demanded by knowledgeable riders; fully padded shin guard topped by elasticized soft leather around top of boot and interior padding at ankles, seven buckles, toe is strengthened by metal tip. Choice of cleated sole/heel for maximum traction in sand, mud, rocks, etc. or with smooth, M-X type sole/heel for long life under the most severe conditions. 17" high. Sizes 7, 8, 9, 10, 11, 12. Specify lug or M-X sole/heel. $59.95

G. "SPRINT" ROAD RIDER BOOTS Made of soft, supple leather for the ultimate in comfort on long tours or short sprints. Full length zipper up the back seam for easy on and off. Three straps provide snug fit. Red, white and blue rally stripes add a touch of style. Heavy duty soles and heels are gas and oil resistant. 17" high. Sizes 7, 8, 9, 10, 11, 12. $36.95

H. H-A R-6 "ASCOT" HELMET—One of the most popular helmets the world over! Full fiberglass shell, bonded styrofoam liner with nylon covered foam rubber upholstering. Only 2.2 lbs., the ASCOT is one of the lightest full cover Z90.1 fiberglass shells on the market. Beautifully finished in black "hand-stitched leather" trim. Sizes "A" (6-5/8–7), "B" (7-1/8–7-3/8), "C" (7-1/2–7-3/4). Available in white, int'l orange, silver-grey or black. $28.95

Also available in "chromeflake" red, blue, gold or green. $29.95

Please specify color and size on order.

I. LANGHORNE LACE-UP BOOTS Ideal for rough riding in any terrain... woods, mountain trials or desert. Laces up full length for superior calf and ankle support and protection. All leather. 17" high with extra thick leather on foot. Reinforcing added to all wear points. One-piece sole/heel of special, long wearing composition rubber. Black. Sizes 7, 8, 9, 10, 11, 12. "E" Width.

Smooth moto-x type sole	$39.78
Goodyear lug sole	$39.95

J. MOTO-X SOCKS BY "HANG-TEN" If you have ever tried to find socks to go with your riding boots, you will truly appreciate these socks, specially knit to meet the requirements of trials or moto-x riders. They're made of custom blended cotton and synthetic fibers designed for comfort and absorbency without bulk. The length...20" from ankle to cuff...is just right, too, to fit the length of your riding boot. Distinctive, vibrant lime green top with unique "Hang-Ten" feet signature embroidered in red and blue on one side. Sizes S, M, L. $2.75

K. BAJA BAG—Handy go anywhere, carry anything bag secures to any motorcycle by special adjustable, 1" nylon web straps. May be fastened across seat or fender...luggage rack not required. Tough, vinyl coated fabric gives complete all weather protection for your belongings. 14" long by 8" diameter with full length, heavy duty zipper closure. Black, pebble grain finish $7.95

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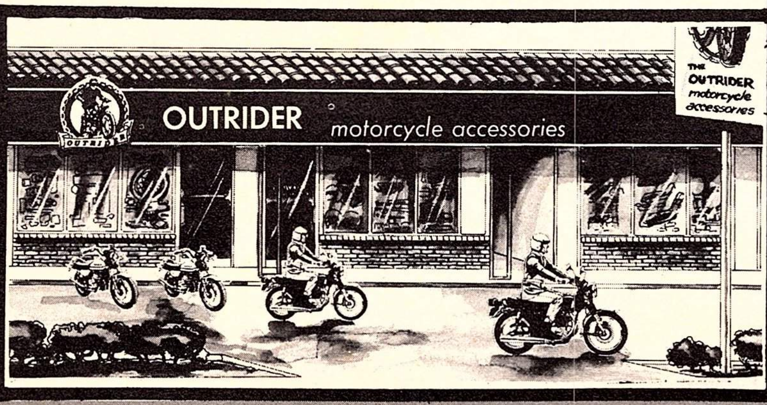

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JESS
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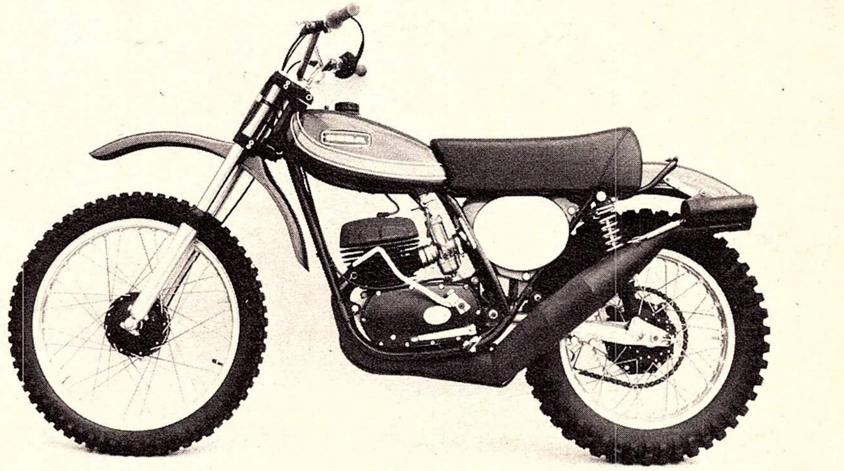
OSSA 250 PHANTOM MX



● After resting too many years on the laurels of their old Stiletto scrambler, OSSA has finally come through with a new group of motocrossers. Called Phantoms (though of no kin to the Benellis having the same name), these racers come in three versions: 125, 175, and 250cc.

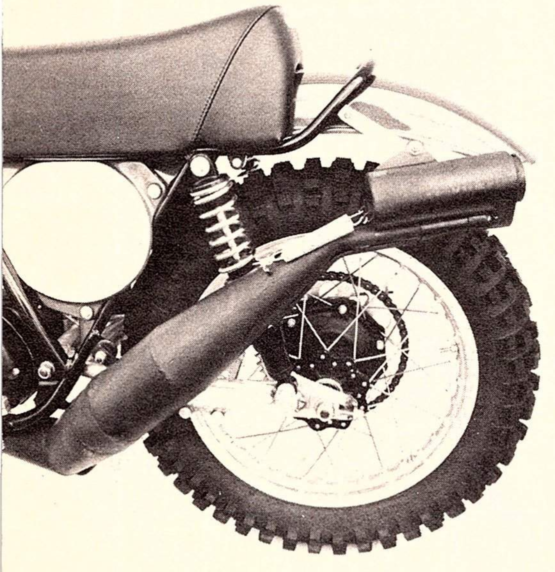
Hard-core motocross racers ask only two questions when word comes of a new model: how much does it weigh, and how much power does the engine make? Any other factor can be tailored, or conned, into shape. The Phantom is incredibly light and it makes a lot of horsepower: 211 pounds brimming with gas and oil, 27.85 bhp with a blown base gasket. That makes it the lightest 250 we've tested. And one of the more powerful.

OSSA's tardiness in introducing the Phantoms was a direct result of their small factory's direction of interest. While Bultaco was busy developing competitive equipment for Jim Pomeroy's incredible GP challenge, and Montesa was gaining hard knowledge from building Kalevi Vehkonen's racers for Europe's only sustained counterthrust to the Japanese giants, OSSA was playing catch-up to the previously established Bultaco-Montesa lead in the observed trials field. OSSA's management had great fun chasing around the world with Mick Andrews, who won the European Trials Championship. But popular interest in trials did not follow as many had hoped, and OSSA was compelled to play quick catch-up in the proven motocross market. And catch up they did.

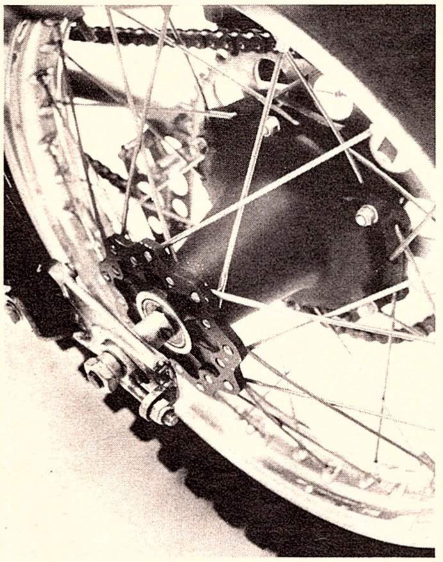
The first step in a major weight reduction program must be to make the frame lighter without sacrificing reliability or rigidity. The accepted material for such a frame is thin-wall chrome moly tubing. OSSA uses this material to good advantage in the Phantom's new frame. Twin engine cradle tubes join a 1.175 inch (45 mm) backbone above the carburetor and at the steering head. For the rear frame section, which supports the seat, fender, and air cleaner and feeds the top shock absorber mount loads into the backbone, the outside diameter is reduced from the

JESS
Cycle

PHOTOGRAPHY: BILL DELANEY



Thick, sumptuous seat is wonderful; fiberglass parts break easily; silencer retains too much engine heat.



Hollow, conical-section rear hub is a masterpiece in the art of aluminum casting. Sprocket and brake are on the same side to use same boss.

Expansion chamber on updated engine helps produce the brilliantly gradual power curve of the Phantom but is extremely vulnerable.

cradle tubing's 1 inch to .715 inch.

No simple flat-plate gussets are used anywhere to strengthen a tube union or mount the engine. All the plates are pressed with strengthening ribs to make them more rigid in the desired twisting and bending directions. Even the front seat mount is box-sectioned and poked through with a pair of fuselage-type pucker holes. There being no structural reason to do otherwise, the steering head body tube is the same size as the backbone and the larger diameter bearing holders are pressed into the open ends. The Timkin-type roller bearings are bigger than would be an equivalent ball bearing, but they're vastly more durable and easy to maintain.

The frame components are MIG (metallic-inert-gas) welded. This process has a continuous roll of filler wire feeding through an electrode gun which surrounds the welding area with argon to prevent oxygen contamination of the weld. This welding process does not produce the fine operator control necessary for making eye-pleasing beads. In fact, the welding looks like a bunch of trained mud-wasps did it. Nearly all of the assembly-line bikes presently on the market are made the same way. But superior weld strength more than makes up for any cosmetic deficiencies the process may have. Structurally, the frame is a masterpiece in engineering simplicity.

Front suspension is an even further refined Betor fork. Identical aluminum alloy forgings are used for the top and bottom clamping brackets and each clamp has a pair of 8 mm sockethead screws to hold the tube in place. The handlebar clamps are a pair of simple and effective machined blocks. A tall rider could drill and tap another set of holes .5 inch farther forward if he wanted to. Carefully baffled and vented caps allow excess pressure to bleed from the tubes during races. Two 6 mm bolts clamp the tiny 10 mm dia. axle in the bottom of each slider. The small axle's weight-reducing theme is continued in the rest of the wheel. A small aluminum brake hub has its spoke flanges reinforced with narrow steel bands between the spoke heads and the insides of the hub rims. Tough stainless steel spokes swell from 3 to 4 mm as their shanks reach the butted ends near the hub. Artificially aged (a chemical alloy-toughening process) aluminum spoke nipples center the Akront aluminum grooveless rim around the hub. Two bolt-type rim locks prevent the Pirelli M-X (3.00 x 21 knob) tire from slipping on the rim due to the extremely low pressures demanded by some circuits.

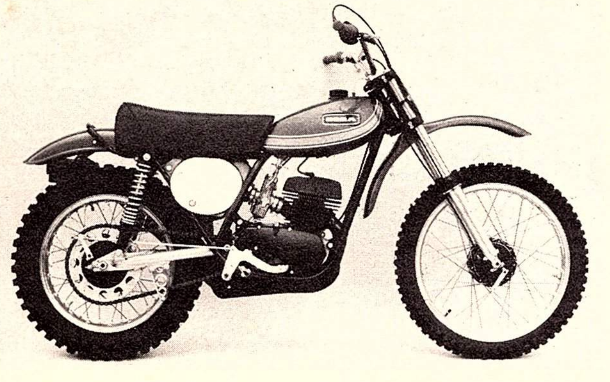
The rear suspension embodies one of our two peeves on the entire bike. For some obscure reason aluminum alloy was chosen for swinging arm material. Any engineer, upon examining the cramped space available, calculating the immense torsional loading applied, and then giving the most fleeting glimpse to an engineering handbook would opt for alloy steel as a material for any swingarm (except perhaps that of a trials machine). The best weldable aluminum alloy would have to be three times as thick as commonly available chrome-moly to be as stiff. The swinging arm tubes are welded together and to a pair of forged wheel-mounting plates. We do not understand why the swingingarm was made of aluminum and we think it's going to give trouble.

Betor shock absorbers provided adequate rear wheel control on the rock-hard, slick and relatively smooth Valley Cycle Park course. The springs are very stiff, as they are on any expert-class motocrosser, and even on the softest of the five spring pre-load settings the bike bounds along stiff-legged when ridden casually. Betor's damper rods have been increased to 12 mm in diameter to make them tougher, and a larger shock body diameter of 38 mm indicates that the damping pistons have been made larger so that oil capacity could be increased. The geometry of the swinging arm and shock absorber relationship is completely orthodox. Of the dazzling array in new rear suspensions, the forward-mounted shocks, the air shocks and various monoshocks, none of those seen on the works bikes has yet shown up on production machinery except Yamaha's. There are many compelling arguments as to the merits and drawbacks of each new and tricky system. Only time can tell which system will be the best compromise for a certain type of terrain.

The Phantom's rear wheel hub is a true work of art. Cast of an extremely tough aluminum alloy, the hubs walls taper from the combination brake-sprocket side in a huge hollow cone to the spoke flange on the left. With the brake and sprocket on the same side, only one of the side flanges has to be strong enough to transmit the torque of the engine and brake, and the whole hub may be made lighter. A unique feature of the brake is its replaceable iron liner. Two radial set-screws prevent the liner from creeping and permit its removal. Although heat transfer with this method can never be as good as with a properly designed cast-in liner, we did not have any trouble with brake fade or see any discoloration on the drum to indicate uneven drum-hub contact.

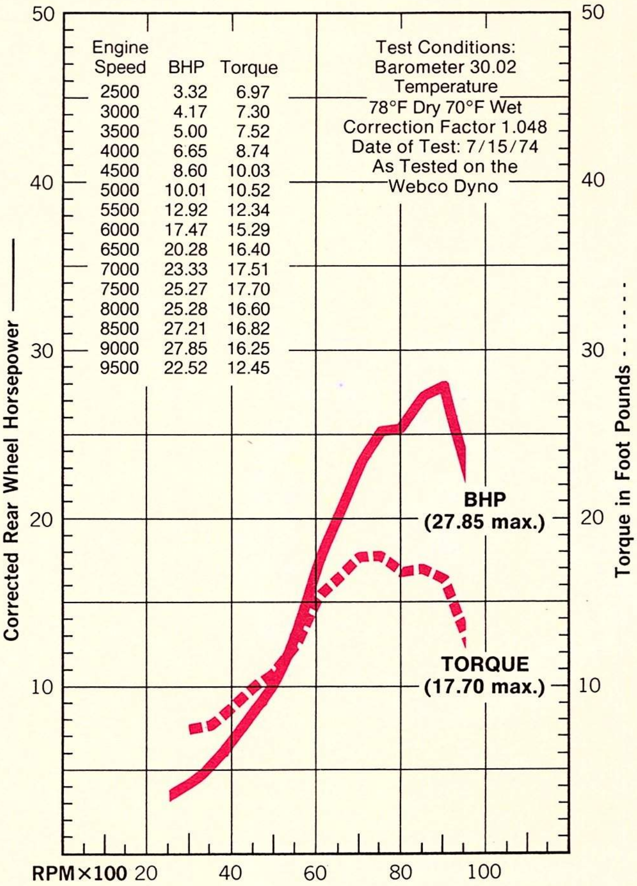
A forged aluminum alloy rear brake lever pulls a long rod to actuate the shoes. Machined serrations on the pedal provide a sharp and slip-proof boot surface. Part of the lever forms a stop which hits against the magneto cover to position the pedal. Contrary to present convention, there is no anchor strap to transmit braking force to the swinging arm. Instead, a groove in the backing plate slips directly over a peg welded into the swinging arm. In years past, bikes which had this kind of anchor sooner or later suffered fractured backing plates from the terrific pounding caused by braking on rough ground.

The seat, tank, both fenders and the air



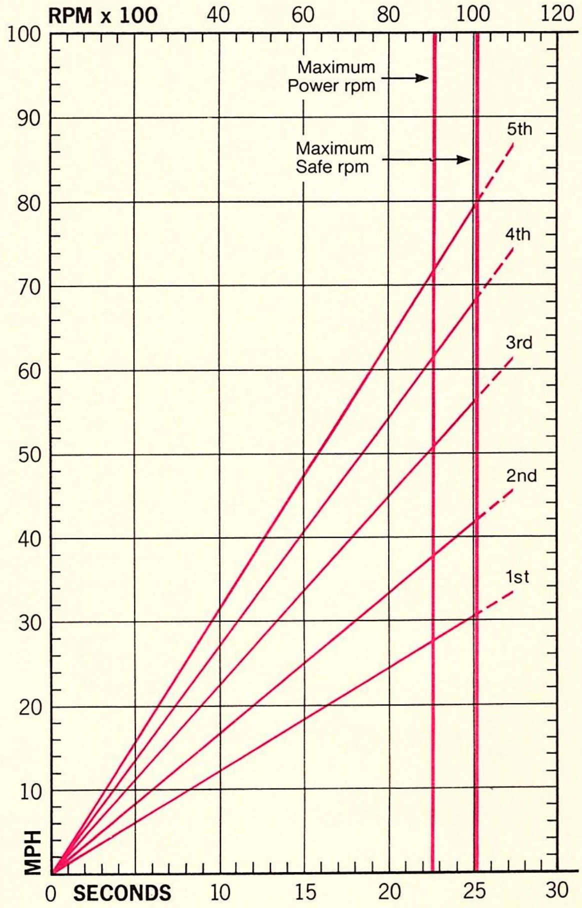
OSSA 250cc PHANTOM MOTOCROSSER

Price, suggested retail	$1380 (Average U.S. plus freight & dealer prep.)
Tire, front	3.00 x 21 Pirelli MT 07 Motocross Knob
rear	4.50 x 18 Pirelli MT 16 Motocross Knob
Brake, front	4.8 in. x 1.175 in. (122mm x 30mm)
rear	5.9 in. x 1.175 in. (150mm x 30mm)
Brake drum swept area	39.5 sq. in. (254.9 sq. cm)
Specific brake loading	6.86 lb./in.^{2} (0.48 kg/cm^2) at test weight
Engine type	Piston-port two-stroke single
Bore and stroke	2.83 in. x 2.36 in. (72mm x 60mm)
Piston displacement	14.84 cu. in. (244.29cc)
Compression ratio	13.2 nominal, 7.6 corrected to exhaust opening.
Carburetion	One 36mm Spanish Bing
Air filtration	Dry micronic paper
Ignition	Magnetically triggered Motoplat CDI
Bhp @ rpm (actual maximum)	27.85 @ 9000
Torque @ rpm	17.7 lb. ft. @ 7500 (2.45 kg M @ 7500)
Rake/Trail	31 degrees/4.5 in. (31 degrees/11.43cm)
Mph/1000 rpm, top gear	8.04 with standard gearing
Fuel capacity	2.37 gal. (9 liter)
Oil capacity	Mixed in fuel
Transmission oil capacity	1.06 qt. (1 liter)
Gear ratios, overall	(1) 25.95 (2) 19.16 (3) 14.27 (4) 11.68 (5) 9.98
Primary transmission	Duplex chain; 2.26:1 ratio with 34/13 sprockets
Secondary transmission	#520 roller chain (5/8 in. x 1/4 in.)
Wheelbase	55 in. (139.7cm)
Seat height	33 in. (83.8cm)
Ground clearance	7.5 in. (19.05cm)
Curb weight	211 lb. (95.69kg) with full tank fuel
Test weight	371 lb. (168.25kg) with rider
Instruments	none
Sound level (AMA Standard)	75–78 dB(A)
Standing start ¼-mile	16.69 sec @ 71.2 mi./hr. (16.69 sec. @ 114.6 km/hr)
Top speed	72.37 mi./hr. (116.4 km/hr) @ max power rpm with std. gearing



Engine Speed	BHP	Torque
2500	3.32	6.97
3000	4.17	7.30
3500	5.00	7.52
4000	6.65	8.74
4500	8.60	10.03
5000	10.01	10.52
5500	12.92	12.34
6000	17.47	15.29
6500	20.28	16.40
7000	23.33	17.51
7500	25.27	17.70
8000	25.28	16.60
8500	27.21	16.82
9000	27.85	16.25
9500	22.52	12.45

Test Conditions:
Barometer 30.02
Temperature
78°F Dry 70°F Wet
Correction Factor 1.048
Date of Test: 7/15/74
As Tested on the
Webco Dyno



cleaner box are all made of fiberglass. Any of these articles is susceptible to being fractured in a crash. We fell off the Phantom twice and got the front fender both times. The other pieces mentioned are fairly well protected by the bike's hardware, but they will go the way of all fiberglass eventually.

The combination air cleaner box and number plates completely fills the cavity under the seat. A portion of the rear fender forms the backside of the box. Cracks between the fender and cleaner can easily be fixed with normal race preparation's liberal dousing of silicon seal. The treated paper element does not stop microscopic dirt very well, and a small amount of water soon clogs its pores. OSSA spokesmen recommend slipping a dry Filtron sock (#K-203) over the paper element for security, and a spare sock should be ready for substitution between motos. The air cleaner is accessible after removing the seat's two retaining bolts and lifting the seat aside. A 10 mm wrench removes the single nut securing the fiberglass and cover on the filter element.

A firmly resilient slab of foam rubber 5.5 inches thick cushions the rider from much of motocross's awful beating. While the cushioning properties of the seat are among the best on the market, the vinyl covering may as well be coated with grease at the mere thought of getting wet.

Tank shape is pleasing and safe: all the corners are nicely rounded and the seat/tank junction is perfectly integrated. A vent hose comes from its tube in front of the filler cap and tucks neatly into the steering axle. The filler cap is molded of black bakelite, has course threads for easy engagement, and covers a filler neck with a full 2 inches (50 mm) inside diameter to permit entry of big fuel can spouts. Both fuel valves leaked fast enough to make puddles on the shop floor until we filed the tank nipples flat. They were tight after that, but their new position caused the on-off lever to hit the frame when the tank was being removed. A cork gasket in the filler cap will probably have to be changed often or replaced with a fat neoprene o-ring. The tank holds a generous 2.3 gallons (9 liters) without being bulky and intrusive to the knees and crotch during a race.

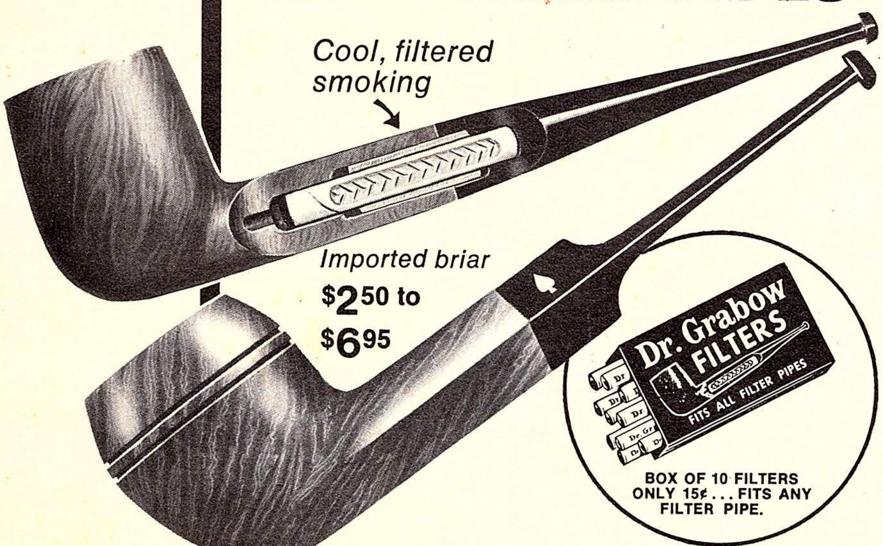
The Phantom's engine is a further development of the tried-and-true OSSA mill that last powered the Stiletto scrambler. As refined for hard MX usage in the Phantom, the power curve has been altered drastically, the crankshaft has been made much stiffer, and the gearbox ratios have been changed to suit the new power and weight.

Basic cylinder and head castings are as before. The alteration in power characteristics starts with new port timings and shapes. Compression ratio is now 13.2 : 1 (7.6 : 1 when calculated from exhaust closing). Compared to the Montesa, which produced the highest power reading of any 250 crosser we've tested (see May '74) and had a nominal ratio of 12 : 1, the OSSA C.R. is pretty high.

Phantom handles and tracks predictably in most situations if quick throttle is very carefully adjusted.

Feeding new cylinder timing is one of the new 36 mm Spanish Bing center-float carburetors. Two rubber adapters fit the carb to the cylinder and air cleaner in a vibration-damping and temperature-insulating live mount. Simple, Italian-type hose clamps keep the carb securely vertical. Loosening the clamp screws permits the carb body to be rotated to a horizontal position for metering adjustments and cleaning. Some careful attention must be given to returning the top cap in its correct position after adjustment. The two screws which secure the cap can be installed with the cap rotated 180 degrees. It happens that the throttle cable is offset in the cap and the slide will not open fully when the cable is nearer the rear of the carb body. There are two identical pairs of bosses on the carb body and top cap, which are of no value in getting the cap on right. Phantom owners would do well to file off one set of bosses or mark the cap and body with aligning indicators to prevent mis-fitting in the heat of battle. With an engine as highly tuned as the Phantom's, mixture control at full throttle is extremely critical and the needle hanging down in its jet that little bit could definitely cause trouble. Inspecting the float chamber contents showed that the float needle will drop out into the dirt after the bowl is removed. OSSA people say that some do and some don't, so be warned. The float needle is the Holley-type with a ball and spring detent to prevent fuel flow surging. The needle jet is held in place by a ball union with the emulsifier tube. If the needle jet is removed, it should be replaced and the emulsion tube tightened against it, with the slide and needle in place to center the

Dr. Grabow
DUKE FILTER PIPES



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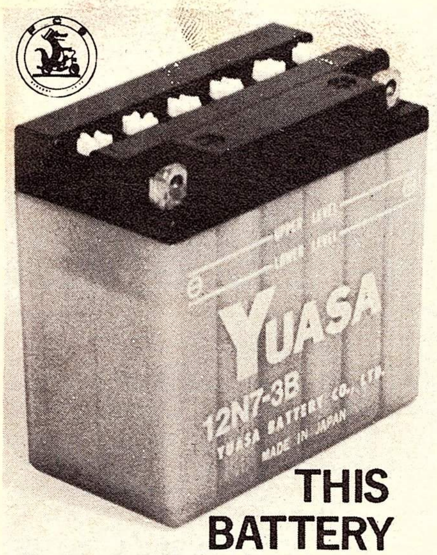

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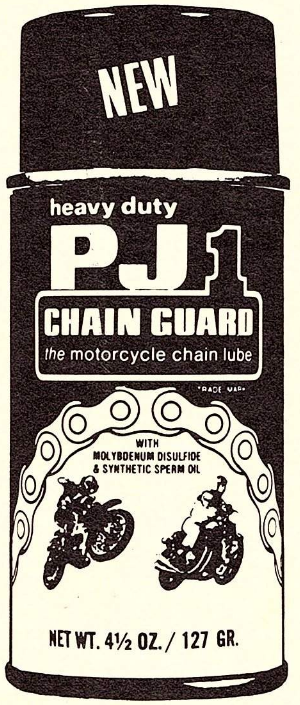
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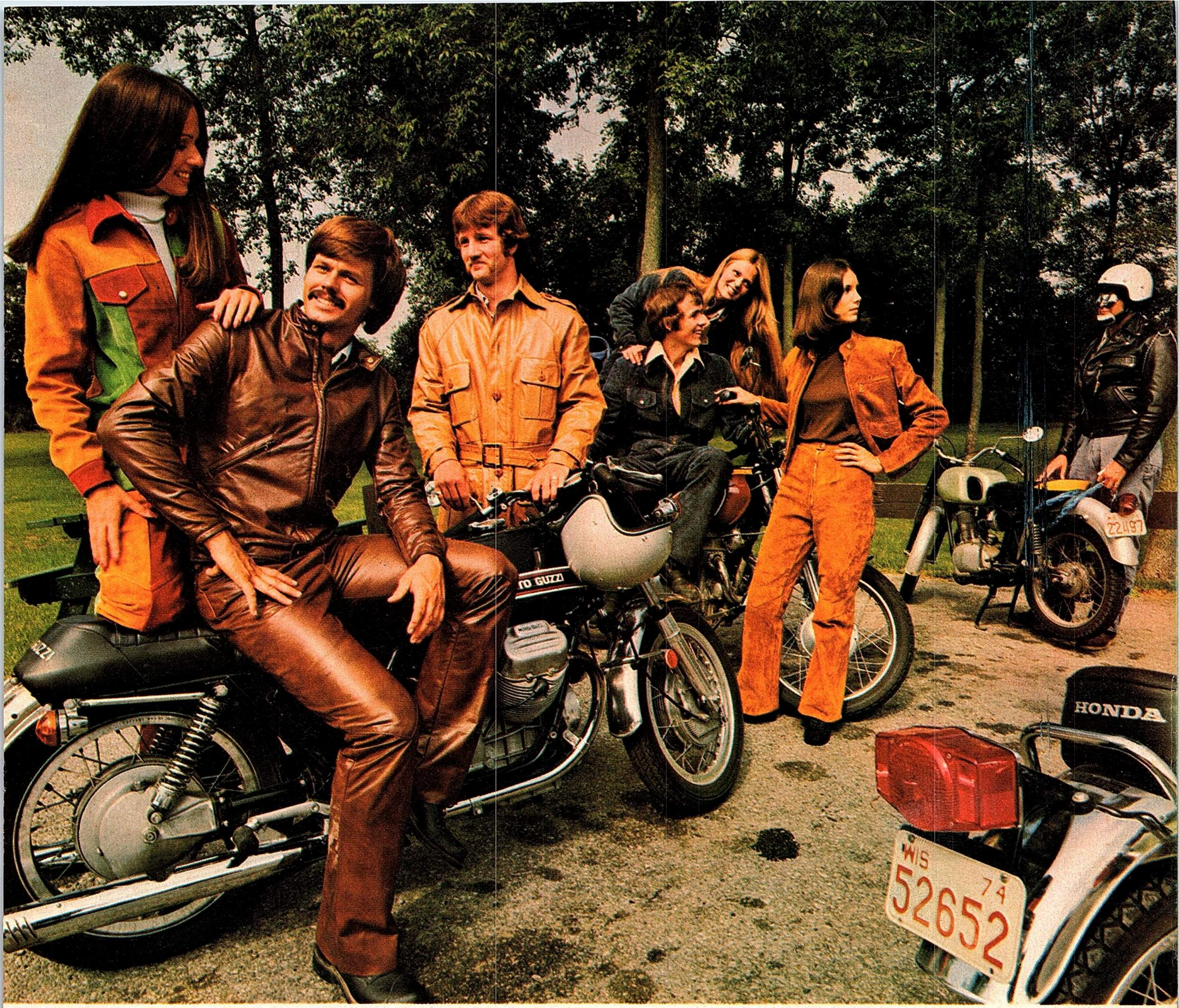
needle jet properly. Otherwise the jet could cock and cause the needle to bind. The emulsifier tube is tightened with a 10 mm wrench and the main jet screws into it. The slide is cast in zinc alloy (which has a much lower expansion rate than the aluminum carb body), so the slide will not stick if some dirt should get into the carb when it is at racing temperature. The float flooding plunger is shrouded to keep water out and gas in. An overflow hose carries excess fuel away from the carb when it is flooded for starting. The carb functioned perfectly throughout our test.

The final part of breathing control is exercised by the exhaust system. Two very stiff springs hold the pipe into a spigot mount in the center of the cylinder between the twin frame down tubes. As the expansion chamber swells directly under the engine, it is secured by a Lord-type rubber live mount before the piping curls up alongside the bike from the frame-swinging arm juncture. More rubber mounts hold the pipe to the side of the frame. These kinds of mounts were designed to cushion loads in compression: with something pushing their threaded ends toward each other. When operated with the rubber filler in tension, or worse yet, a combination of tension and shear, they will quickly fail in the presence of severe vibration, and the slightest crash will easily rip the mounts asunder. Perhaps this latter is what the OSSA people had in mind and it is a point which will be more thoroughly discussed later.

The Phantom sits high. Our six-foot rider could just firmly plant both boot soles when standing astraddle. Sitting compressed the seat and shocks enough to keep both feet against the hard California soil. It's a good, long, straight-armed reach to the bars and the Magura-type levers feel natural to outstretched fingers. At 211 pounds, the bike feels like a 125 of three years ago. With both fuel valves on and the float bowl flooded, the rider is obliged to stand to the left of the machine and jab at the long, folded-out kick-start pedal with his right boot. A quick and hard jab brings the engine snarling quickly to life without a lot of cold-engine stutters. Tweaking the grip gingerly produces an explosive burst of revs. An easy pull on the clutch and nudging down on the left foot pedal engages low and the Phantom carburates cleanly away as the throttle and clutch coincide. First gear is extremely low with the standard 12 tooth sprocket (25.95, as compared to 20.95 for the Montesa, and 22.7 for a Honda CR250). Low produces hardly any acceleration at all, any throttle opening being entirely spent in wheelspin. Engaging second gear in the pit area gave the right feel for starting out. A slight amount of body movement fore or aft allows the rider to choose the best compromise between the front wheel predictably climb-

(Continued on page 37)



The Leathers You Choose Say a Lot About You

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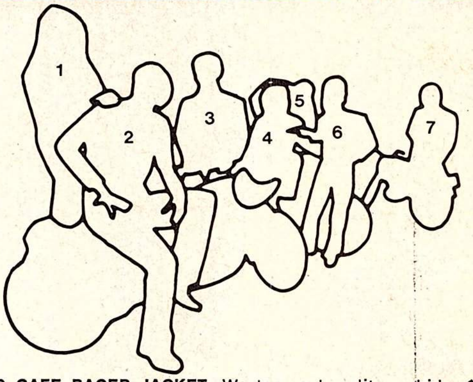

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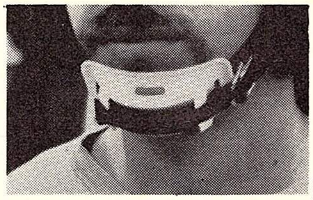
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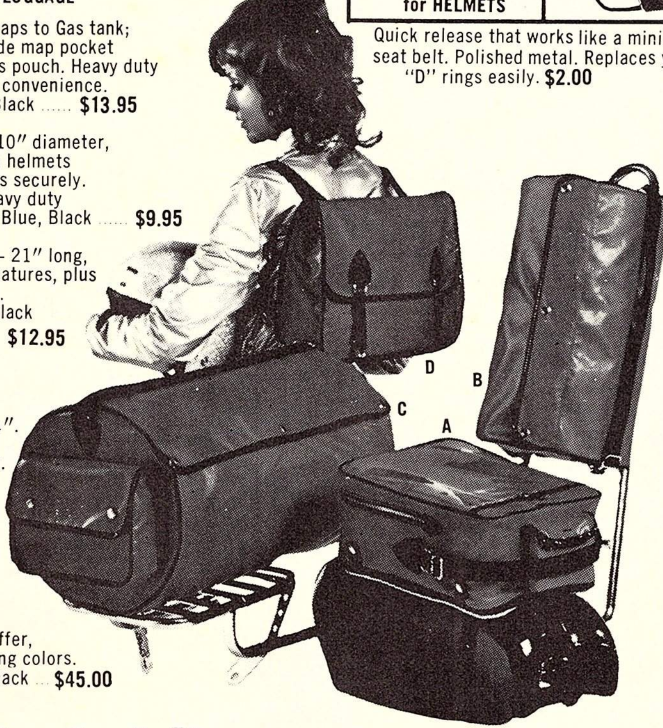

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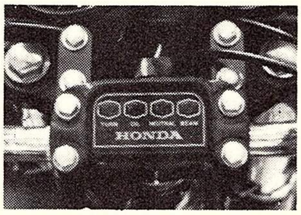
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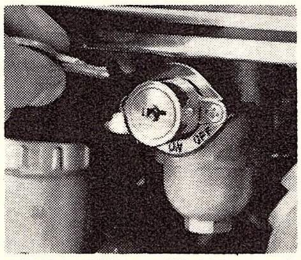
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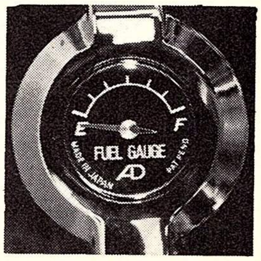

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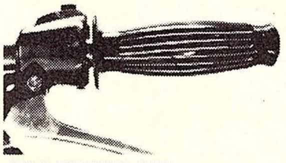
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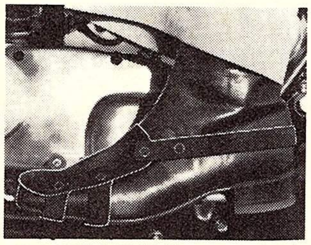
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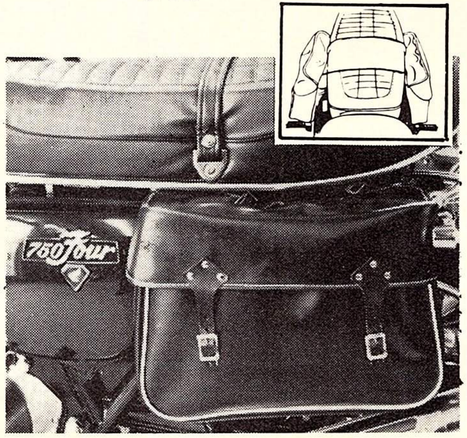

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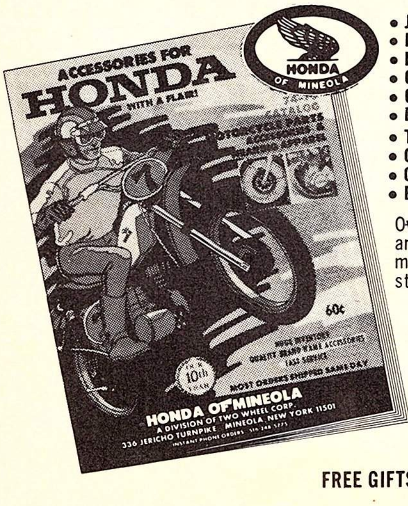
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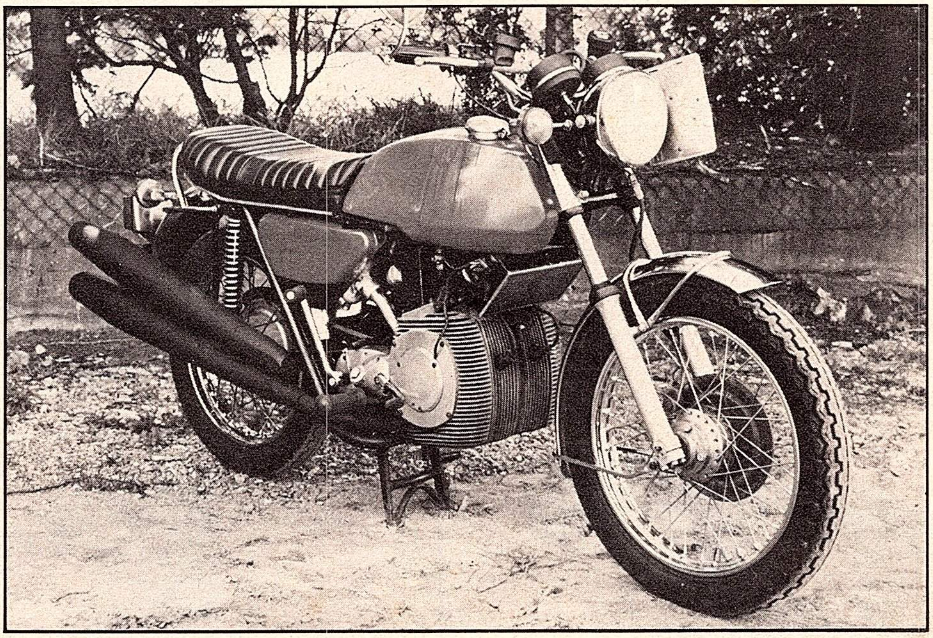
TRIUMPH ROTARY



By Cook Neilson

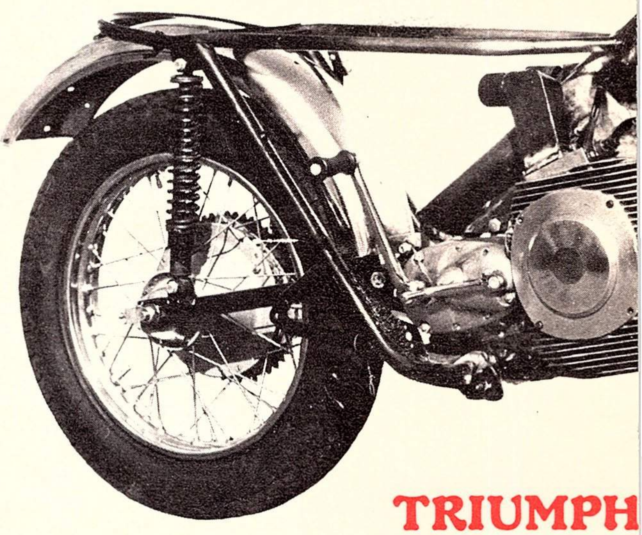
● There are those among us who do not love the Wankel engine. It is after all an alien lump of aluminum with arcane internals and an outward appearance only an air conditioner salesman could love. There are no cylinders or cylinder heads, no cam shafts, no pistons going up and down and no connecting rods, valves, gudgeon pins or springs. We do not know how to discuss its displacement. We suspect that it is a "dirty" engine, purified only by hot and expensive after-combustion processes that are feasible inside the engine bay of an automobile and surpassingly difficult on a motorcycle. It is neither a four-stroke nor a two, so defenses traditionally used by the champions of one in the face of attacks by the other are neither valid nor rational. The engine looks to be difficult to service; if not difficult, at least unfamiliar.

But those among us who do not love the Wankel have not ridden the one presently under development by Norton-Triumph. It is a revelation: smooth, torquey, light, responsive, pleasant in nearly every way, and capable of jerking the eyes out of a good-running 750 Trident. The Norton-Triumph rotary project was initiated five years ago and is presently being prodded along by David Garside, a development engineer for whom the Wankel is as much passion as project. Fichtel and Sachs supplied the first engine—a 300cc fan-cooled single-rotor model originally designed to function as a stationary industrial power-plant—and BSA shoehorned it into a 250 Starfire chassis. They liked what they had wrought. But they did not like the thermal problems the engine was experiencing, nor did they find the automatic solution (water-cooling) palatable, because of the necessary addition of weight. So BSA-Triumph called Bert Hopwood out of retirement, and Hopwood got the project going in the direction that yielded what you see here. BSA-Triumph built their own dual-rotor engine, which was in effect a pair of the original Fichtel and Sachs 300cc Wankels. Changes were abundant. In the first place outer finning was made so heavy and each fin carved so deep that the outer housings were not only substantially stiffer but afforded two to three times as much cooling area as a comparably potent two-stroke.

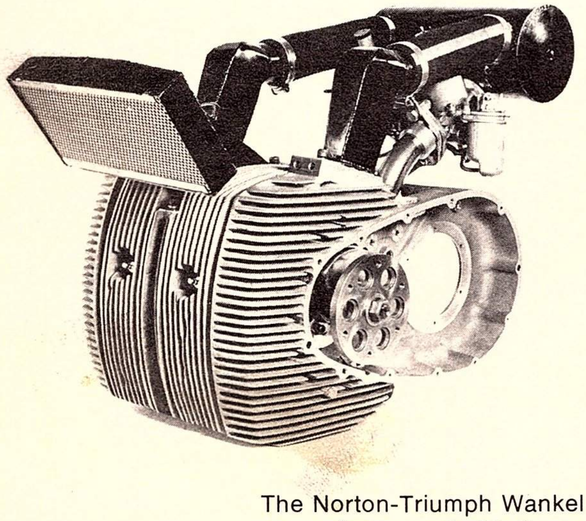
To finalize engine cooling Garside developed a variant on the Sachs approach. In the Sachs Wankel fuel-air mixture is routed from the carburetor through channels in the rotor and the housing, and then—finally—into the combustion chamber. Not only is additional cooling provided, but lubrication as well. Alas, there is a problem: the mixture is heated and thinned, and volumetric efficiency suffers. Garside devised a system whereby air is pulled in through the air cleaner (mounted beneath the fuel tank and forward of the engine), through channels in the housings and rotors, back to a plenum and finally through the carburetors and into the combustion chambers. Still, the air presented to the carburetor intakes is plenty warm. It exits the housings at 100°C and drops to 75°C in the carburetor plenum. But the spray of gasoline added by the carburetor drops the air temperature down to 50°C, a number that is still warmish but not so hot that performance suffers markedly.

And there is plenty of performance. Doubling up the original Fichtel and Sachs rotaries doubled horsepower (to 39–40 hp), and adding Garside's version of charge-cooling picked it up to 48. Replacing the SU carbs with Amal concentrics and setting the compression ratio at 8:1, together with further porting improvements, jacked power up to 60–65 hp., where it was when *Cycle* had an opportunity to take it for a 45-mile hoot through the English countryside.

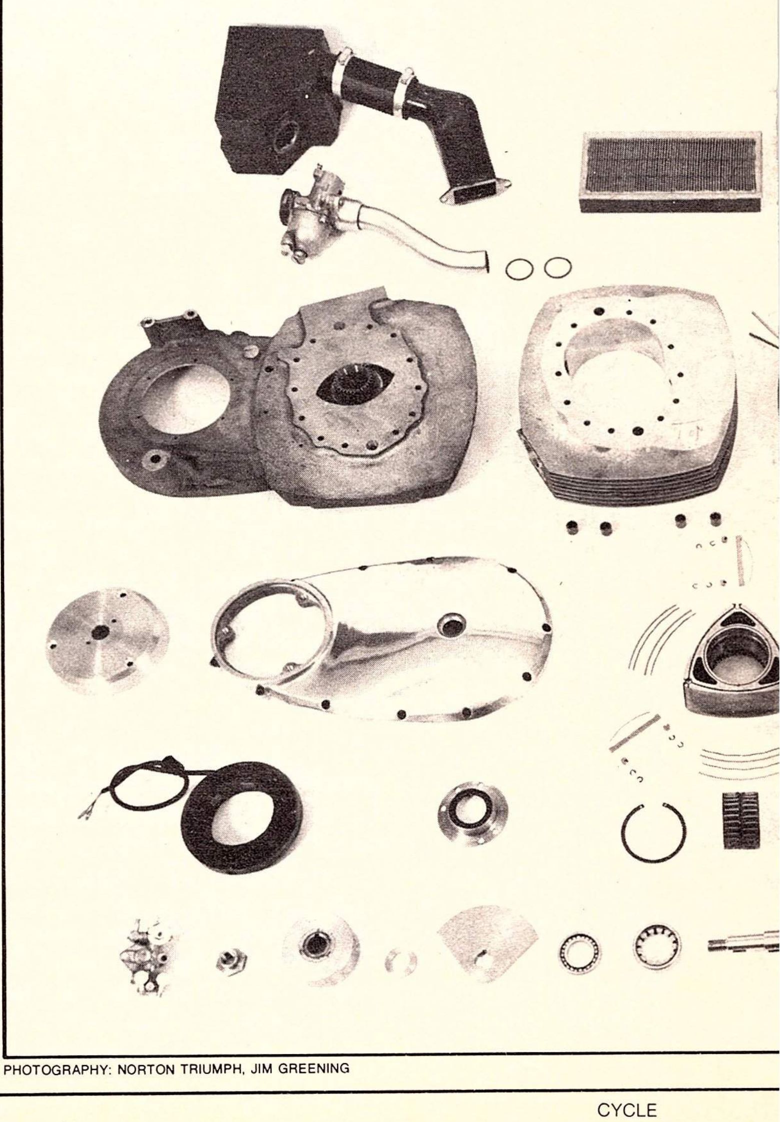
Because it was important to present to the cylinder "heads" as much cooling air as possible, a downtube-type frame was not considered. Instead a phone-pole-size backbone suspends the Wankel and serves as an oil reservoir, and ties into another pipe running vertically from behind the transmission. A pair of tubes emanate from beneath the footpegs, tie into the swing arm locating gusset and arch up and back providing upper shock mounts and joining with two other mem-



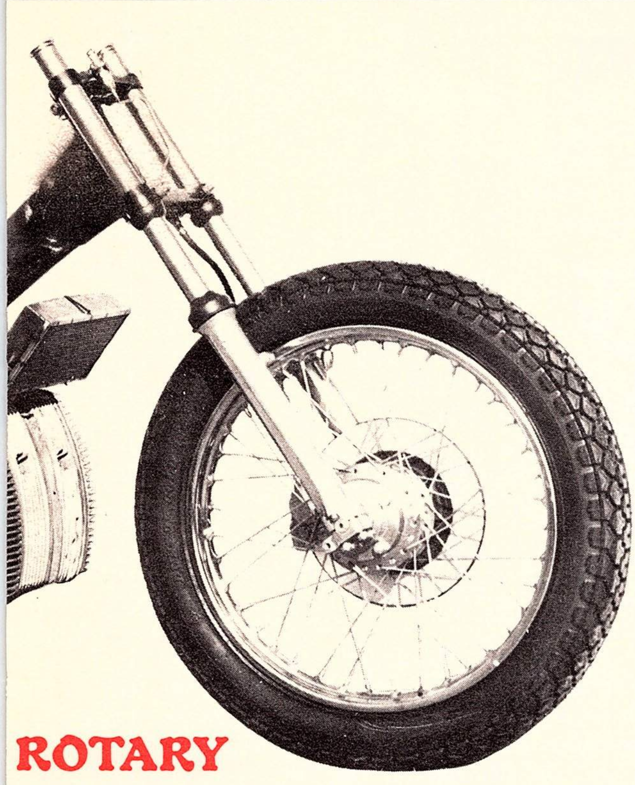
TRIUMPH



The Norton-Triumph Wankel is the only rotary that is free-air-cooled. Heavy finning also reinforces housing. The chassis (top) is formidably straightforward and stout; main backbone tube also serves as an oil reservoir. Downtubes could not be used because they would shroud cylinder "heads."



PHOTOGRAPHY: NORTON TRIUMPH, JIM GREENING

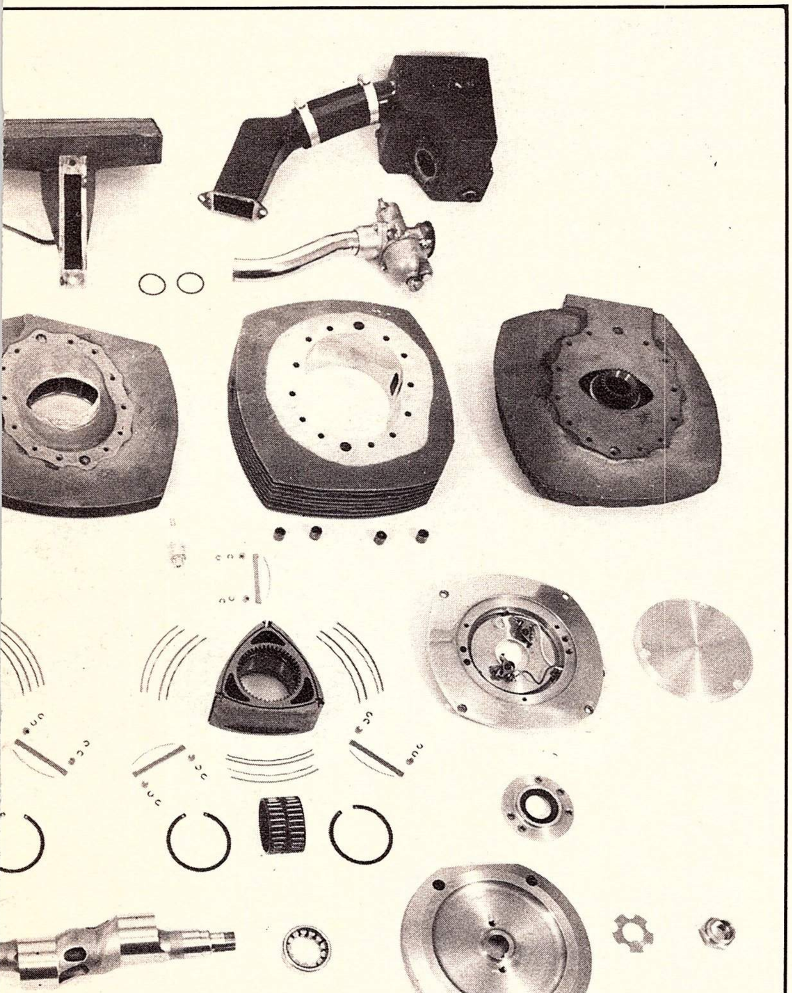


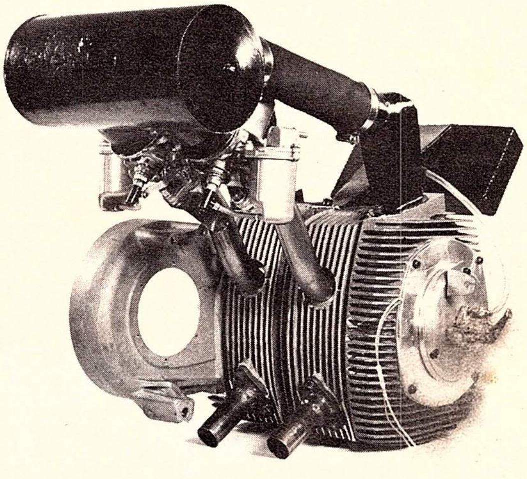
ROTARY

bers that provide a location for the seat and rear fender. An obvious effort has been made to duplicate motorcycle engine appearance. The transmission is separate, the primary drive cover is British Traditional, and all the fins reflect motorcycling's historic solution to heat dissipation. But it's still a lump, and it still *looks* like a lump, fins, covers, outside oil pump and all.

It most decidedly does not run like a lump. There were two Wankel prototypes available at Norton-Triumph's Kitts Green R&D facility. In order to effectively evaluate the Wankel's performance, however, Bob Trigg and your correspondent headed out with one of the rotaries and a standard 750 Trident. Thorough carb tickling and a couple of lusty spins with the kick-starter (electric starting is envisioned for the future) yielded a busy thrashing beneath and an authoritative snarl through the exhaust. A longish warm-up and we were away.

The Wankel is just like a motorcycle, only faster and smoother. It purrs. It sings. Mid-range throttle roll-ons showed that the Wankel was vastly quicker than the Trident, and the Trident is no slouch. Swapping motorcycles emphasized the pure pleasure of not having to contend with engine vibration, either—the Norton-Triumph twin-rotor Wankel is as smooth as the smoothest Honda CB-500 or Suzuki GT-550. De-

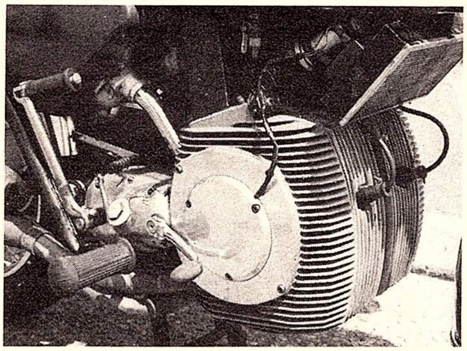




Complex simplicity typifies the Tri-Nor rotary. Few moving parts are necessary, but the design and engineering that goes into them is critical and exacting. Viewed from the rear (above), the carburetor plenum and longish intake runners can be seen. Throttle response is excellent.

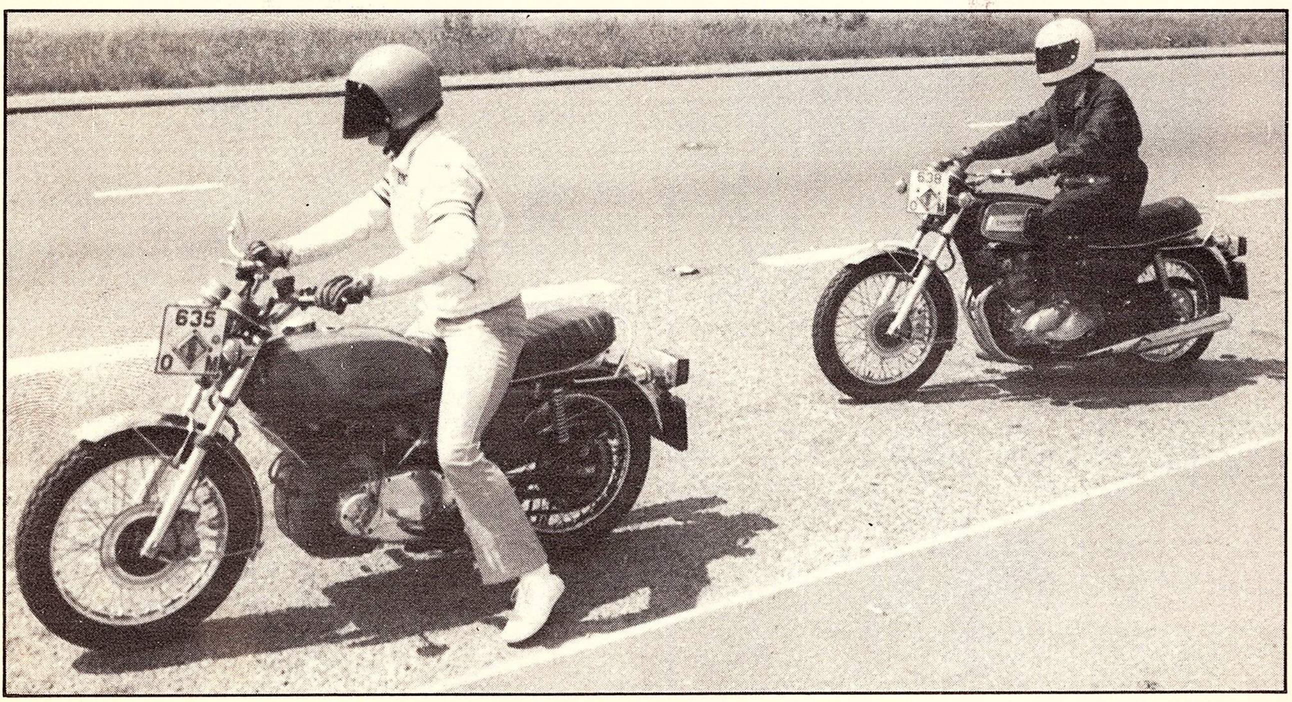
TRIUMPH ROTARY

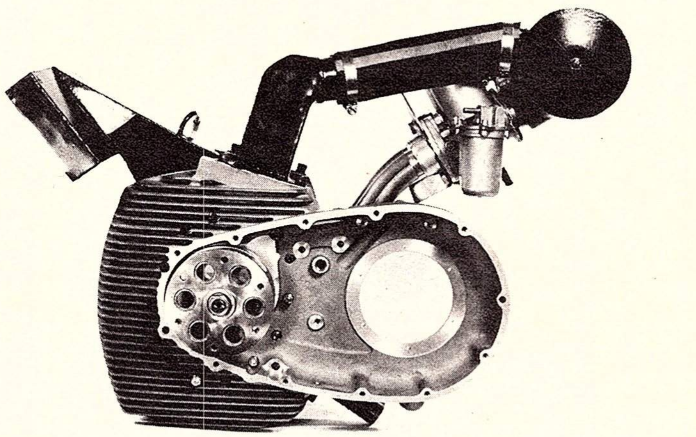
The rotary has a lot going for it. It's light, can be positioned low in the chassis, makes an abundance of power and doesn't know the meaning of the word "vibration." Here's hoping Norton-Triumph can manufacture rotaries in quantity—soon.



spite the length of the chrome-plated intake manifolds throttle response is neither noticeably quick nor noticeably slow. Engine braking is comparable to a 750 two-stroke, but engine note is like nothing we've ever heard before: a combination of a collectored CB-750 and a hot Kawasaki H2 suggests the sound, but not completely. And the engine's willingness to rev is unparalleled. It doesn't build engine speed with the same suicidal abruptness as an H2, but the feeling is that rpms will continue to swell until the frequency has become so high that you can no longer hear it at all. It comes to life at about 4000 rpm, and feels capable of spinning from there to oblivion, spooky-smooth and willing.

Of course it's not perfect. It pops and bangs some on over-run (a Wankel characteristic if ever there was one), it makes a great noise but too much of it, it was difficult to restart when the engine was up to full operating temperature and the absence of compression resistance does not give you a good, firm starting point when the time comes to boot it to life. But the basics are there, in full flower: smoothness, light weight, response, acceleration, top speed (the bike we rode had been clocked at 127.29 mph at the MIRA test facility, and had howled to a 104.54 mph quarter-mile terminal speed). If Norton-Triumph can either build it or find someone to build it, and if Bob Trigg can work his styling magic on its gnarly exterior, and if emissions and noise problems can be solved, then the bike will knock the motorcycling world right on its collective ear. Sure, there are a lot of question marks. But its potential is incandescent and its smoothness and performance are shattering, and if ever there was a situation where the *ifs* merit solution, this is it. ◉





Wankel in a Nutshell

● ***History:*** Dr. Felix Wankel, a German engineer-inventor, began looking at the rotary engine concept in 1926, and by the early Thirties had established a research institute to conduct a molecular examination of the problems that rotary engines presented. There were three: reduce the number of arrangements and cycles that were possible with the concept; develop a workable operating cycle and port timing parameters to go along with it; and finally, develop means by which a multiplane combustion chamber could be properly sealed.

Despite the complexity and unfamiliarity of the idea NSU, a German automotive firm, became interested in applying several of Wankel's ideas to a compressor that might be used on motorcycle engines. A contract was signed between Wankel and NSU, and Walter G. Froede of NSU became involved. Froede shortly refreshed the entire concept, and the result was much like the Wankels of today: stationary outer body, rotating "piston."

Meanwhile Wankel had developed his rotary engine theory into a supercharger, used with great success by NSU in establishing several Land Speed Records in 1951. The concept operated as an engine rather than a supercharger for the first time in 1954, and in 1957 Froede accomplished what became known as "the kinematic inversion"—holding the body stationary and spinning the rotor within. Suddenly, with Froede's inversion, the Wankel became a reality.

In 1958 Curtiss-Wright, hoping to turn around a decline in their aircraft business, bought all North American rights from Audi (patent ownership is in the hands of two groups: Volkswagen AG of West Germany, through its 90% holdings in Audi-NSU, controls 60% of the rights, and Lonrho, Ltd. controls the other 40%, having purchased Wankel GmbH from Dr. Wankel himself). Largely due to the efforts of Charles Jones and M. Bentele the Wankel grew more and more practical. By 1960 Curtiss-Wright had developed its RC-2-60 engines (two rotors on a common shaft), and in 1965 NSU, using some of its own developmental ideas and some of Curtiss-Wright's, presented the first Wankel car: the NSU Spider. In 1969 Mercedes-Benz previewed the C-111, a 190 mph auto that bowled over the world's sporty-car enthusiasts and was never subsequently produced.

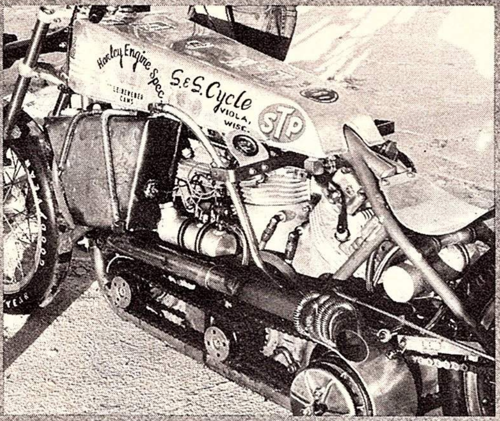
As of now there are many manufacturers licensed to produce Wankel-engined motorcycles and automobiles, among them General Motors, Citroën, Toyo Kogyo, Daimler Benz diesel, Alfa Romeo, Rolls Royce diesel, Porsche, Suzuki, Yamaha, Toyota and Ford. Chrysler is doing research and development on the Wankel, but does not have a license as yet to manufacture it for sale.

How It Works: A three-faced, triangular-shaped rotor is contained within a housing. The inner, working surface of the housing is called an epitrochoid (the word is given to the path described by a point within a circle rolling around another circle). The tips of the triangular-shaped rotor are always in contact with the inner surface of the housing, much as a piston is always in contact with its cylinder. There are two holes in the housing: one is for intake and one is for exhaust. The eccentric motion of the rotor pulls it away from the intake port just as the port is uncovered by the leading edge of one of the rotor's three faces. The rotor, on its eccentric shaft, creates a vacuum between its face and the epitrochoid, and fuel-air mixture is pulled in through the carburetor. As the trailing edge of the rotor sweeps past the intake port, the air-fuel mixture is trapped between the face of the rotor and the housing. The shape of the housing and the action of the rotor then proceed to compress the trapped mixture and sweep it around towards the spark plug. Approximately 18° before maximum compression is achieved the trapped volume is ignited by the spark plug (comparable to 18° BTDC spark timing on a conventional engine). The expanding combustion gases drive the rotor further around its eccentric path. Space is provided for these hot gases by motion away from the surface wall by the rotor (comparable to the expanding volume available to an ignited fuel-air charge on the power stroke of a normal engine). Once again the gases, now spent, are compressed by eccentric action, and as the leading edge of the rotor face sweeps past the exhaust port the gases are squeezed out through it, and the face is once again ready to pull away from the wall and accept a fresh intake charge.

Looking at the rotor from the side, there is a generous hole in its middle. Gear teeth are attached, which mesh with teeth machined on the shaft around which the rotor spins. As the rotor rotates it transmits force to the teeth of the central shaft, spinning it as well. The spinning shaft corresponds to a pinion shaft on a traditional motorcycle crank; it drives the clutch, which powers the transmission, which turns the rear wheel.

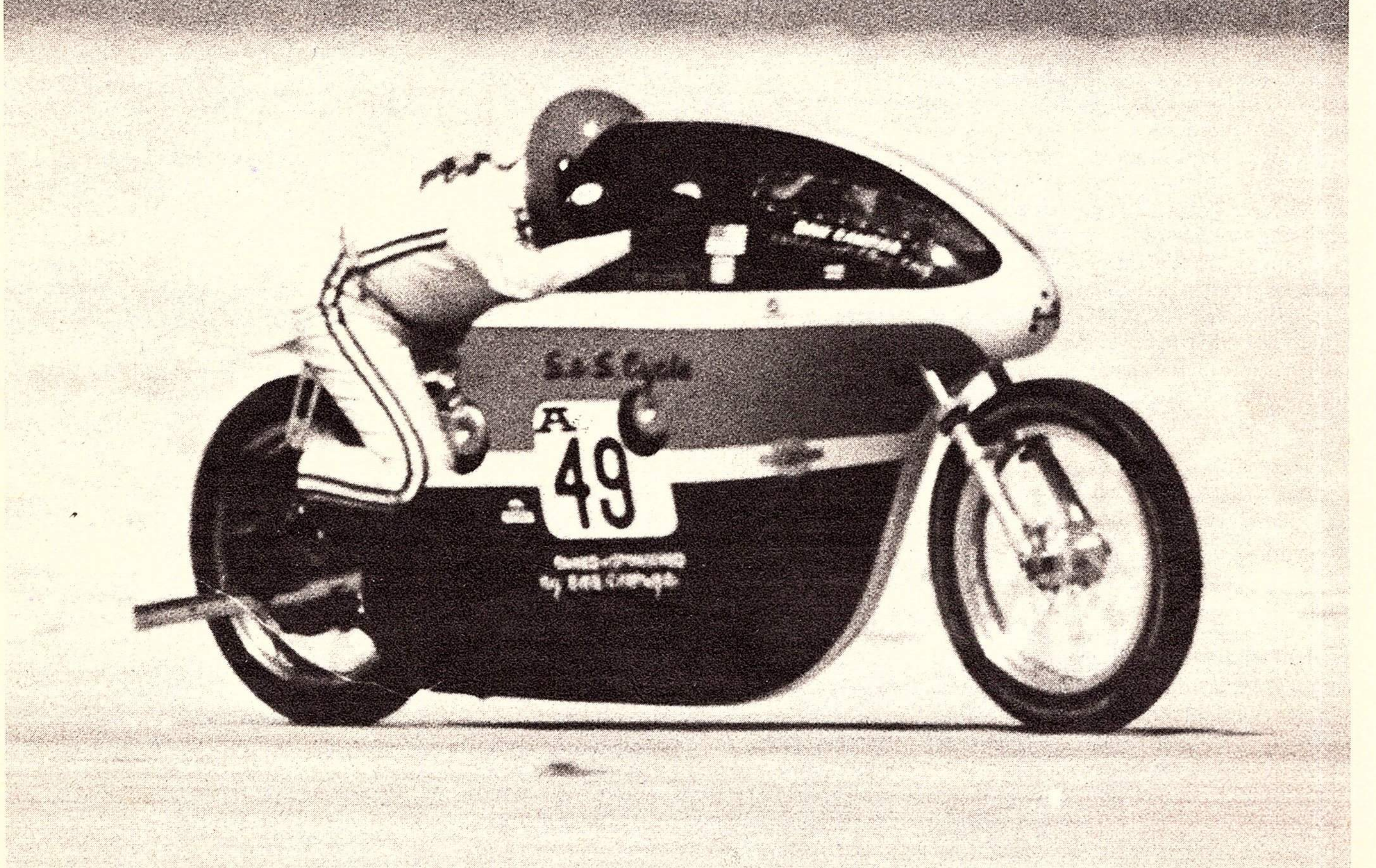
—Cook Neilson

Sources: *Scientific American Magazine, Vol. 227 No. 2, and "Analysis of the Implications of the Wankel Engine as an Alternative Auto Power Source," presented by W. E. Hutton & Co., members, New York Stock Exchange.*



Bonneville 1974

Nitromethane, displacement, water-cooled cylinders and five years of perseverance won't take no for an answer. When Bob George and his rider, Dave Campos, finally departed Utah's spooky flats they left behind an untouchable record for nonstreamliners (231.597 mph) and a rumbling echo that took the tops off the mountains. And just for laughs they also set a new record on gasoline. For Bob George it's been a long, tough, frustrating five years that finally paid off in the largest possible way.

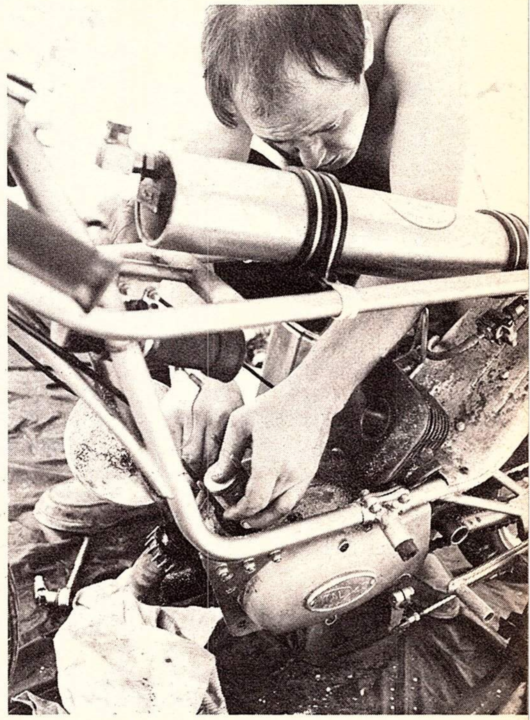


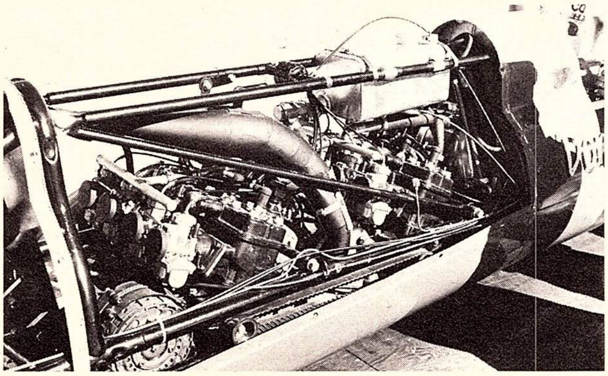
PHOTOS BY FRED FREUDENBERGER

Bill Vickery went 178.7 on his TZ-700 Yamaha, taped seam in fairing and went 183.796 mph.

After 15 years of generous, fair service to Bonneville racers, Earl Flanders is retiring. You were great, Earl, and thanks for everything.

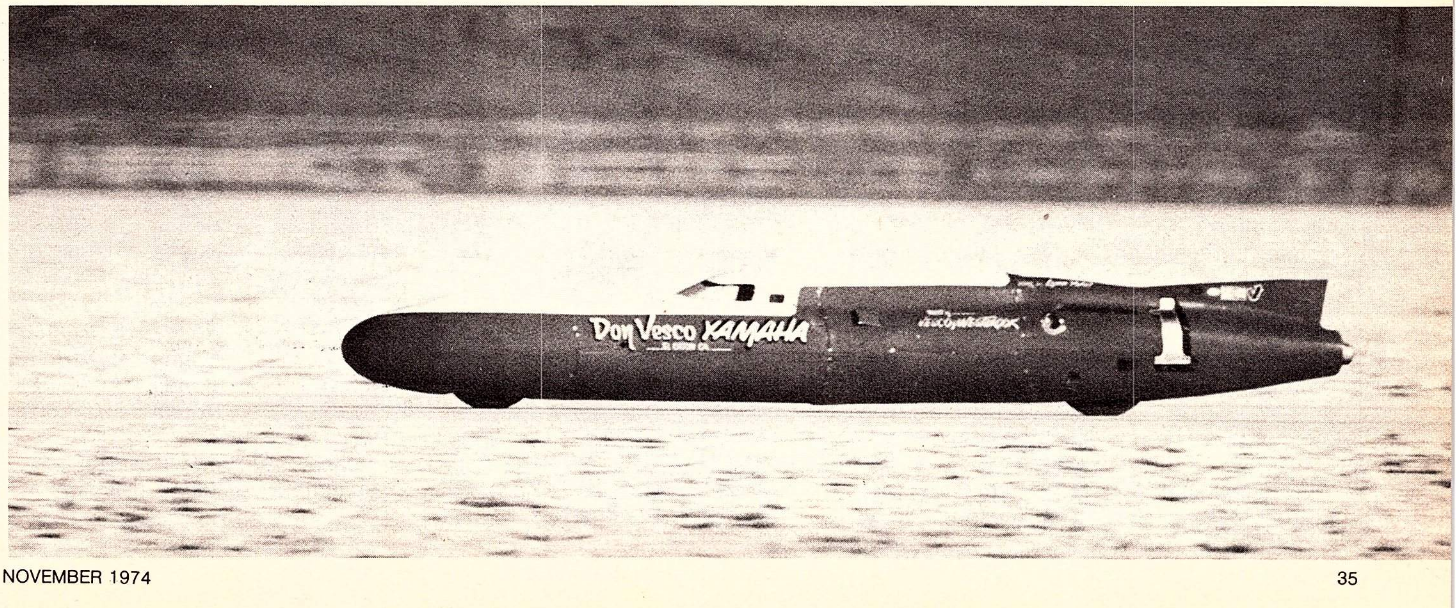
Frank Fisher's 50cc Ital-Jet ate its trick piston, so a stock one was installed and the little bike ran a solid 87 mph.



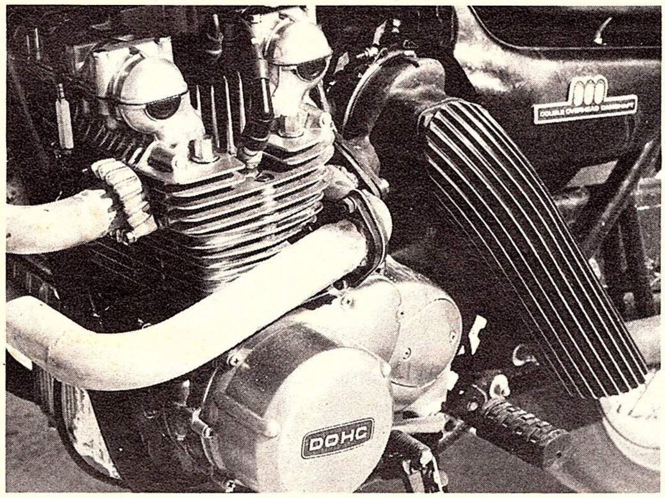


Twin TZ-700s are coupled with a pair of Gilmer belts, one on each side of the engine package. The streamliner handles reasonably well, but the dog speed-wobbles.

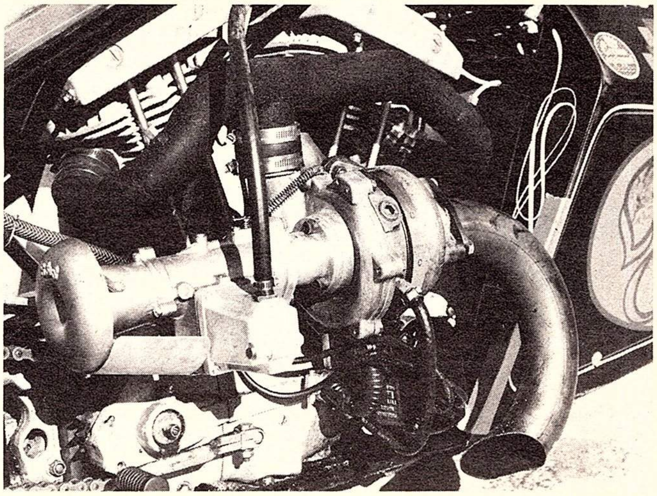
Nobody works harder at going fast than Vesco, who went 248.397 with one engine.



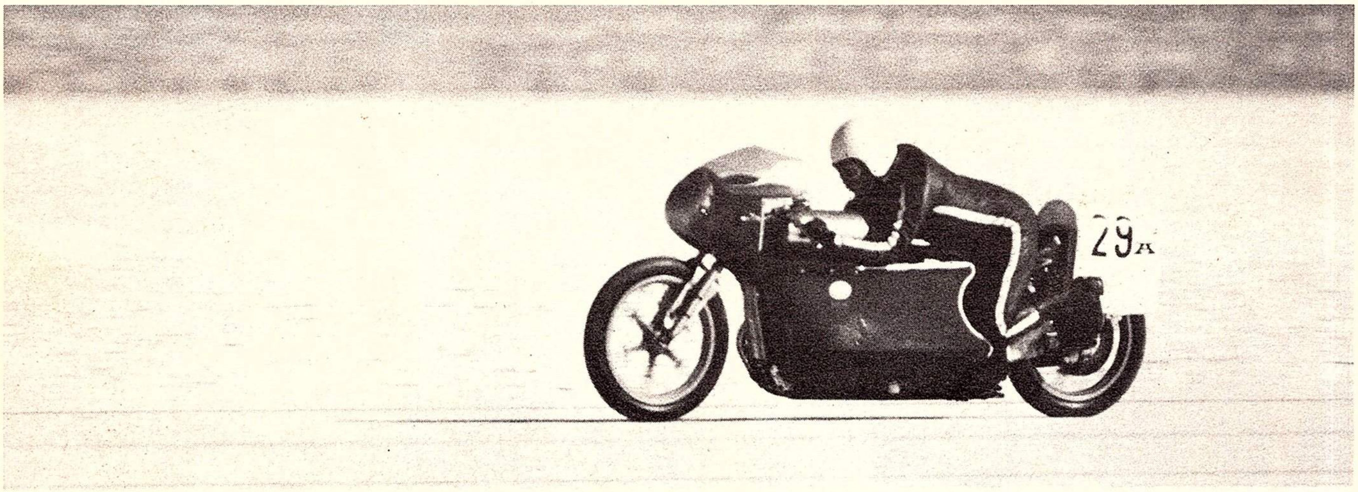
Pat Siddall's super-clean turbocharged Z-1 had a best run of 153 mph. Bike was ultra-quiet; streetable turbo-kits for Z-1s are on the way.



The Martinez and Blessingham lowliner: puffer by Rayjay, plumbing by Martinez, induction by S&S and displacement (98 cu. in.) by H-D.



Tom Elrod's Superhog: one of two that shredded the potash.



Name	Class	Bike	Speed
Don Vesco	S-C-750	Yamaha	248.397
Don Vesco	S-AG-1250	Yamaha	248.285
Dave Campos	APS-AF-3000	H-D	231.597
Dave Campos	APS-AG-3000	H-D	208.450
Warner Riley	M-AF-2000	H-D	199.500
Tom Elrod	S-AG-3000	H-D	197.047
Bill Vickery	MPS-AG-750	Yamaha	183.796
Don Vesco	MPS-C-750	Yamaha	178.527
Don Vesco	MPS-AF-750	Yamaha	178.442
Michael Corbin	Experimental	Electric	165.367
Tim Durkee	A-AF-750	Triumph	160.173
Rodney Fleischmann	M-AF-1000	Honda	153.294
Jim Yriberry	A-AG-1250	H-D	152.388
Scott Guthrie	M-AG-1250	H-D	152.002
Scott Guthrie	M-AF-1250	H-D	150.888
Scott Guthrie	A-AF-1250	H-D	146.956
Doral Eckhardt	A-AG-350	Yamaha	141.928
Tom Whiteman	MPS-C-1250	H-D	141.481
Bill Vickery	MPS-AF-250	Yamaha	141.426
Bill Davis	A-AF-350	Yamaha	138.155
Tom Whiteman	M-C-1250	H-D	141.481
Ellis Lemberg	MPS-AG-500	Kaw.	135.256
Pat Siddall	P-750	Kaw.	135.244
Brian Eriksen	APS-AF-350	Yamaha	133.537
Tom Poster	M-AG-350	Bultaco	118.577
Sharon Vickery	M-PSC-125	Yamaha	119.032
Steve Cole	M-AF-350	Yamaha	116.006
Dale Ebersole	M-C-125	Yamaha	110.398
Steve Cole	P-350	Yamaha	108.548
Mark Lingua	M-PS-125	H-D	106.305
Gordon Seim	MPS-AG-125	Suzuki	103.126
Bruce Morris	A-AG-125	Yamaha	101.770
Gordon Seim	M-AG-125	Noguchi	99.289
Bryan Bowns	MPS-AF-100	Honda	98.445
Philip York	M-AF-100	Honda	96.618
Tom Conway	MPS-AG-100	Kawasaki	93.186
Bruce Morris	A-AG-125	Yamaha	91.371
Tracy Walsh	MPS-AF-50	Honda	76.686
Tracy Walsh	M-AG-50	Honda	70.314
Tracy Walsh	M-AF-50	Honda	68.820
Douglas Walsh	P-100	Honda	65.696

Total Records Set: 41—Yamaha: 16, Harley-Davidson: 11, Honda: 7, Kawasaki: 3, Triumph: 1, Suzuki: 1, Bultaco: 1, Electric: 1.

OSSA 250 MX

Continued from page 24

ing and the rear wheel beginning to snake from side to side. On loose or hard dirt, shifting early in the rpm band gives an unbelievable rush of acceleration.

After the engine got good and hot we headed out onto the parched, pebble- and powder-covered monument to self-abuse that is Valley Cycle Park's short course. The engine was still smelly-new so we rode easily around the track, getting warmed up and only gassing it a little when in the vicinity of the photographer. Both brakes work with predictable sureness. On the second lap in the last powdery climb to the peak, the engine stalled from a little too much pressure on the brakes. Lack of a primary kickstart is a real bummer when you are on a hill, trying to find neutral and hold onto the front wheel brake while climbing off the bike to start it from the left. After a while we began to get on the throttle a little harder and noticed a lot of pinging and rattling from the engine on uphill climbs. Inspection showed that the carb needle was in the lowest of its three positions, so we raised it to the middle notch. Happier sounds came from the engine but the Champion N-2G plug still showed lean with a #165 main jet (the largest in the bike's standard equipment selection) installed. After taking it easy for the remainder of the first tank of gas, the engine began to tighten on the third lap of the second tank. Slowing down to a lope again restored the engine's crisp feel. On the next hard-charging lap, we were exiting the first turn and getting a good hard drive toward a small jump that has some ripples at its base. With the throttle open enough to sustain a wheel lift, the rear wheel hit the small ripples and began to slam violently from side-to-side. The next sound was a sort of twin splat as our rider and the Phantom struck the ground.

The pipe was flattened somewhat, the bars were seriously kinked, the front fender was shattered and the rider was seriously wondering if his breath was ever going to return. Back at the shop, we wondered if we hadn't just over-boogied a hair and gassed it too hard on those ripples. Band-sawing the pipe into pieces, straightening the kinks, and welding the thing back into an assembly gave us plenty of time to think it all over before calling Yankee Motor Co. for the other pieces and bigger jets.

Inspection during reassembly showed that there were faint seizure marks on the piston. These were carefully dressed off with a fine jeweler's file and corresponding touches in the cylinder were cleaned off with green-grade 3M scouring pads. The Phantom's piston rings are the very thin (1 mm) clip-type with chromed edges that, as far as we know, were developed by the Wiseco Co.

After all the pieces, new and repaired, were reassembled many more break-in miles were logged on the bike, during which the main jet was raised to a #170. Another check on the engine settings was made and the machine was taken to Webco for the dynamometer test. The engine ran faultlessly on the pump but its cylinder head temperature climbed so fast that it was necessary to let the engine cool for a period between the power readings at each rpm step. Almost as an afterthought, we decided to run a few checks with the silencer removed. The maximum readings were almost identical along the scale but the cylinder head temperature was much lower with the open expansion chamber. Exhaust gas has to make two 180 degree turns in the silencer and the resulting restriction to flow doesn't let the heat escape at high revs. This would explain why the engine regained its sharpness at the track after we allowed it to loaf for a couple of laps when the engine was new and the mixture was too lean. Anyone attempting to race a Phantom in the desert would do well to replace OSSA's silencer with one of the straight-through fiberglass-packed variety.

Toward the end of the dyno runs oil began to saturate the engine cases and drop steadily on the floor. We thought at the time that a gasket or oil seal had ruptured but a check back at our shop showed that the cylinder base gasket had blown out at the transfer port bulges and the oil we had seen had all come from the escaping fuel mixture. Wow, we thought. Almost 28 bhp with a blown base gasket. A replacement gasket was quickly cut out of gasket material that was 0.3 mm thick and we raced to Webco the following morning to satisfy our curiosity and conscience. But the engine tightened and seized on the first hard run.

Back at the *Cycle* shop we observed that the homemade gasket had compressed more than the stock one, and the piston was actually rising above the top of the cylinder liner slightly at top dead center. Three gaskets were necessary to keep the piston top flush after the head was torqued and the engine run a few times. After we were satisfied that the engine was as ready and carefully tuned as we could manage, the rest was gone over equally carefully.

Back at Valley Cycle Park for a final check on our opinions, the engine ran better than ever before. Because of the Phantom's high compression ratio and previous tendency to detonate, several brands of high-test gas were tried (all being mixed in a 20:1 ratio with Castrol R30). The engine was decidedly happier with Union 76 than it was with Shell, Mobil, or Gulf.

The Phantom handled extremely well everywhere on the circuit except that one fast turn where we crashed on the first outing. It is the one place on the circuit where we can accelerate hard enough to keep the front wheel up over a fast and ripply surface while making a turn. The bike will do that wild snake-dance every time under the same conditions, though we did not approach the situation with enough abandon to provoke another spectacular get-off.

On slower turns, where the brakes must be used heavily, the Phantom will make the abrupt change in direction very quickly and easily. It will accelerate as hard as traction and rider ability will allow. On turns where there is a banked berm, the rider's weight must be forced as far forward as possible to keep the front wheel from climbing over the edge as the throttle is opened. The track was so hard in places that our rider could hear the front tire howling as it skidded into the desired direction. Unlike the Yamaha YZ, the OSSA's front wheel can be made to bite on hard, slick turns.

During that session the throttle grip began to migrate on the bars and we missed a power shift several times. A small strip of emery cloth clamped under the twist grip, with the rough side toward the bar, anchored the grip for further use. The shift lever was hitting against the thick-headed screw which holds down the front of an inspection cover over the clutch. We bent the lever out a little bit and the shifting returned to normal.

In a final session for photos we were fairly exhausted and got into one of the hard, slick turns a little too hot. In what would have been a very easy, almost slow-motion slide-out, the Phantom's exhaust system was totally wiped out: kinked, smashed, and completely torn loose from the bike. Perhaps those rubber mounts were made to let the pipe get loose in a fall, but they did nothing to prevent its total demise in our case. We went home to think it all out.

We like the OSSA a lot. It, the Montesa VR, and the Honda CR250 are the only ones of the production motocrossers we've tested so far that we could learn to cope with and enjoy racing on a week-to-week basis. But still, $1400 is a lot of coin to borrow with the prospect of having to replace hoards of fiberglass parts in the near future. And that last little spill we took so light-heartedly would have cost the average weekend warrior at least $100. We still don't have a good feeling about whether the shocks or swinging arm caused the awful snake-dance that tossed us down so hard. If you've got the money to keep up with normal repairs and buy the better second-year pieces that will replace many of the present ones, the OSSA Phantom will be a serious mount for a developing racer. If you've got to watch your pennies, better look at something more durable and developed. Second-year hindsight, after all, is a good point of view when buying any kind of a racer. ◉

SUZ
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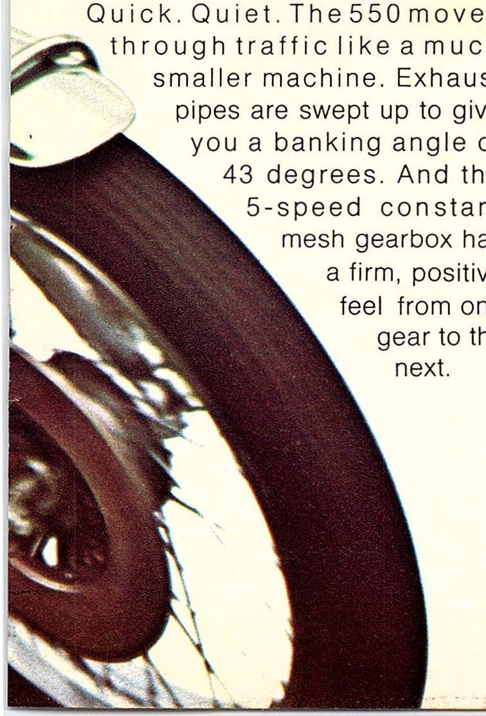
WHEELING ALONG IN FIFTH, THE GT-550 TRIPLE IS SO QUIET YOU ALMOST FORGET HOW POWERFUL IT IS–UNTIL YOU TWIST THE THROTTLE.

Have you ever watched a naturally-gifted athlete make something very difficult look extremely easy? That's what it's like when you're riding the GT-550 triple. Smooth, powerful, beautifully balanced, it seems to glide along without any effort at all.

It's a pussycat in town.

One push on the electric starter brings 48.5 horses to life. Click into first, let out the clutch, and go easy on the right hand.

Quick. Quiet. The 550 moves through traffic like a much smaller machine. Exhaust pipes are swept up to give you a banking angle of 43 degrees. And the 5-speed constant mesh gearbox has a firm, positive feel from one gear to the next.



It's a tiger on the open road.

When you reach the open highway, the 550 really comes into its own. It unwinds at cruising speeds—with power that lets you pass without downshifting.

See the big scoop-like shroud over the cylinder heads? That's the Ram Air cooling system. It bites into the on-rushing air and blows it over the cylinder heads to keep them cool. So heat distortion won't drain off your power.

It's an easy machine to live with.

You float down the highway like you're sitting in an easy chair. The special synchronized linkage has all three Mikuni VM28SC carburetors locked in tune. CCI, Crankcase Cylinder Injection, meters exactly the right amount of oil for any engine speed, automatically.

The tach reads an easy 4,500 rpm at 55 mph. The digital gear indicator shows you you're in fifth. The tripmeter ticks off the miles.

Relax. Enjoy the scenery. And if you get bored, just twist the throttle.

Suzuki warrants internal parts of the cylinder head, block and transmission for 12 months or 12,000 miles. Just comply with Owner's Manual instructions: mail registration to Suzuki within 48 hours and receive service checks from a Suzuki dealer at 750, 2,000 and every 2,000 miles thereafter.

GT-380:
37 Hp. – 6-speed transmission.
Ram Air Cooling.

See the GT-550 at your Suzuki dealer. And while you're there, see the Ram Air cooled GT-380, too.

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SUZUKI®
MEMBER MIC

Ride safely; wear a helmet, eye protection, and appropriate riding apparel.

CIRCLE NO. 34 ON READER SERVICE PAGE.

Do you think ROYAL CRUSADER looks like every other helmet?

LOOK AGAIN!

There are helmets. And there is *the* helmet. What separates Royal Crusader from the rest are *three* layers of protection instead of two. Something we call Poly-Fibertex™.

Conventional helmets rely on an outer shell of either polycarbonate or fiberglass. Both materials offer impressive performance characteristics. Yet both have limitations.

Polycarbonate is so tough it will resist impacts and penetrations far beyond the capabilities of a similar thickness of fiberglass. It's also lighter than fiberglass and can be injection molded to exact tolerances.

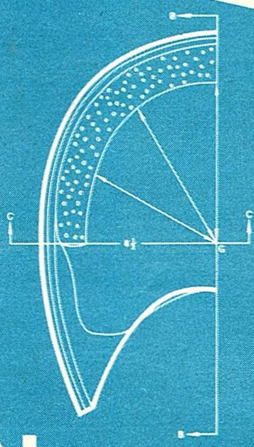
On the other hand, fiberglass has a flexural modulas four times that of polycarbonate. *Translation: it's able to dissipate shock over a wider area with minimum damage.* Fiberglass also has a greater resistance to solvents, fuels and other agents.

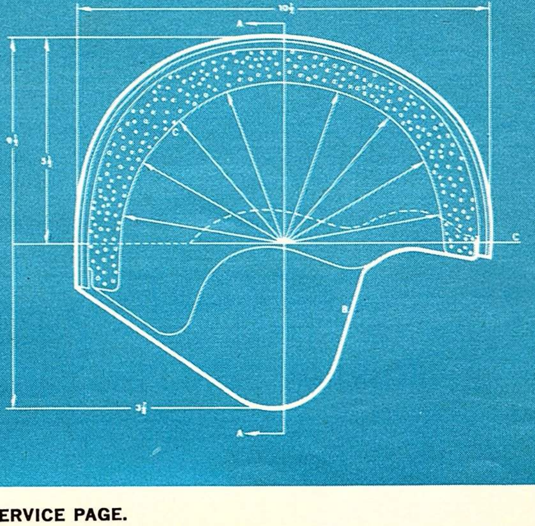
Combining the best elements of both without bonding required a great deal of engineering skill and special design. We took the molded polycarbonate shell which offers strength and toughness and covered it with a fiberglass shell for flexural rigidity and resistance to abrasion and solvents. The two shells are held together by six rivets around the periphery of the helmet. *The sliding movement between these two surfaces on impact, absorbs additional energy!*

Then we added a high hysteresis sizing liner. *(Translation: built in self-retarding effect.)* This energy absorbing foam adjusts itself to the wearer's head . . . snugly.

Result: Royal Crusader. A helmet that meets current safety specifications and requirements, and more.

Write for brochure and price list.





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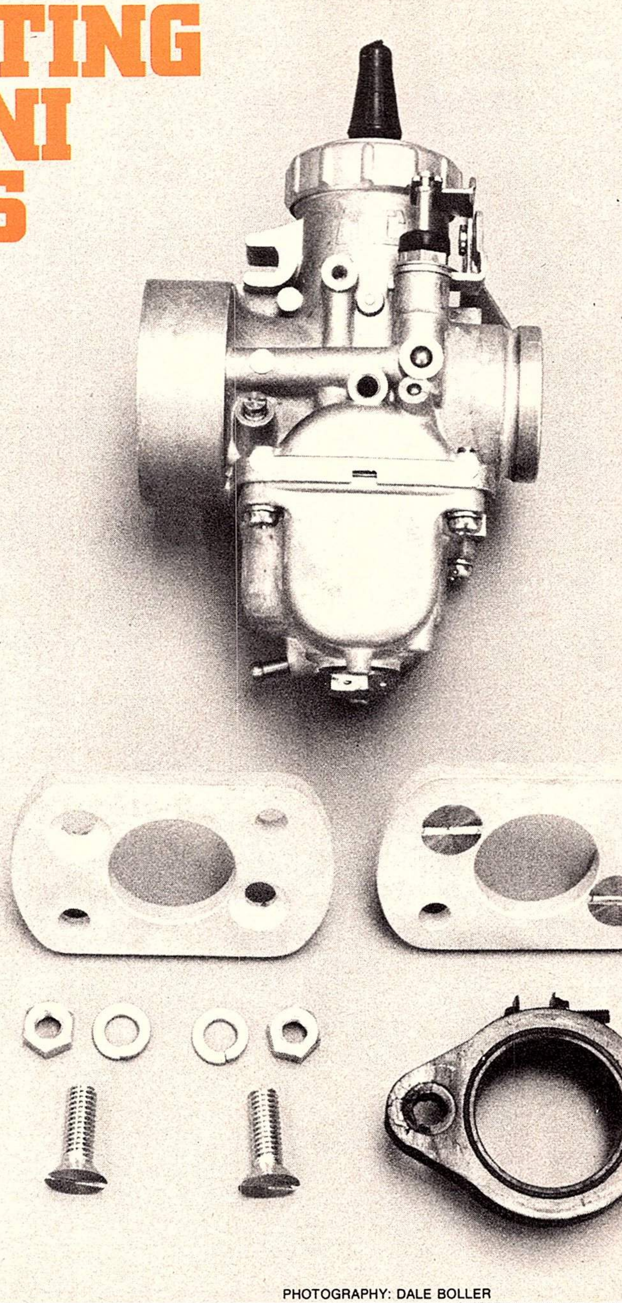
CIRCLE NO. 38 ON READER SERVICE PAGE.

ADAPTING MIKUNI CARBS

Plenty of problems to be solved, lots of questions to be answered and results that depend entirely on the effort put into the job.

By Gordon Jennings



PHOTOGRAPHY: DALE BOLLER

● According to its reputation, the Mikuni carburetor is nothing short of magic! Just hang one on your hot European hummer, rumor promises, and the bike instantly will be transformed. Get rid of that nasty Amal, Bing, IRZ or Jikov gas-passer, the Mikuni converts passionately insist, for then you will have said a final goodbye to the fouled plugs and balky starts that make you swear, sweat, and think of abandoning motorcycles in favor of golf. And what will a Mikuni do for horsepower and mileage? You shouldn't ask, they say. Knowing would only make you feel terrible about all you've been missing.

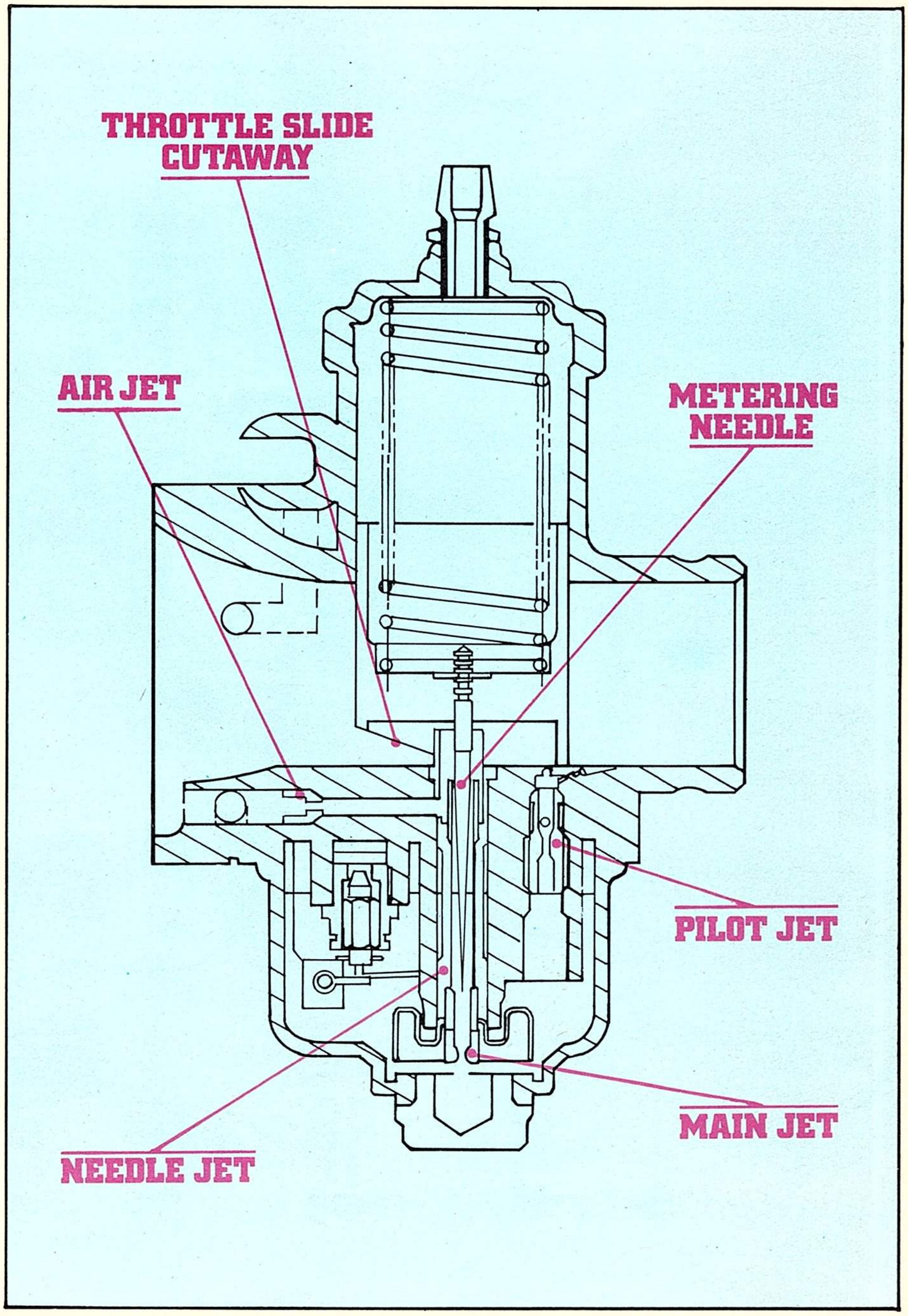
That such extravagant claims *are* being made for the Mikuni carburetor is sufficient to arouse plenty of interest among motorcyclists, and to create a healthy degree of skepticism. Experience has shown that some of the world's air/fuel mixers yield nothing to the medieval thumbscrew in terms of sheer misery potential. On the other hand, experience also has taught most of us mistrust of anything for which magical properties are claimed—and this wary attitude is a fine defense against having one's pockets pillaged. But in the Mikuni carburetor's case we are confronted with an unusual and highly significant distinction: the claims are being made by the customer instead of the vendor. Whatever marvels may be promised by the bench racers, Mikuni's own people venture only a cautious and thoroughly qualified optimism when asked if one of their carburetors might serve as a suitable replacement for the standard item on, say, a CZ or Norton; immediately adding that much depends on the level of knowledge and skill applied in the conversion process.

Out in the real world the knowledge/skill factor varies enormously and this is reflected in the results actually obtained with Mikuni conversions (which sometimes fall far short of reputation's promise). We know of several CZs, for example, in which the desired transformation actually occurred: these somewhat temperamental motorcycles became downright civilized after Mikuni carburetors were grafted on their cylinders. But then there's a certain Honda 750 that has been all tricked out as a cafe racer, and its perfectly satisfactory Keihin carburetors replaced with a set of oversized, badly-jetted Mikunis. The Honda's owner assures us that those big Mikunis have given his bike a big boost in power, improved his pet parrot's appetite and language, cleared up a persistent case of heartbreaking psoriasis, and made him irresistible to beautiful women. What the carburetors really have done is to make his the rattiest-running Honda-based cafe racer in Southern California, a remarkable feat viewed in light of the number and quality of contenders for that title.

So it clearly is possible to get both very good and very bad results from a switch to Mikuni carburetion, which should surprise only those who have swallowed the legend whole—slide, bowl and throttle cable. The rest of us believe about half of what is promised by all the glowing reports, and conclude that even when discounted 50-percent, the Mikuni conversion would be worth doing if we could be sure our personal abilities are equal to the task. And therein lies the rub: talk is just talk; if the job is going to get done you sooner or later will find yourself standing silent beside your bike, eyeing a bare intake manifold flange and wondering where to begin. It's an intimidating situation, and one with which the writer has very recent experience, having arrived at a state of acute disgust with the (expletive repeated) "other" carburetor on my personal motorcycle; having looked at the available conversion kits without finding anything suitable for the application at hand; having gone through all the aggravation of devising and fabricating adapters; and having fought the battle of slides, needles and jetting.

Anyone who in the cold clear light of morning decides to go ahead with the Great Carburetor Swap should first address himself to the question of size. You can of course err seriously in the matter of throat size, and we will discuss that aspect in good time. But equally important, and usually ignored in the early stages of planning, is sheer overall carburetor size and shape. Carburetors of approximately equivalent throat diameters tend to have about the same height, taken from slide cover to float chamber base, but the Mikunis are comparatively wide and their shapes very blocky—meaning that you probably will find yourself fighting for the space needed to accommodate a Mikuni and provide access to its adjustments.

Accessibility may become a real problem when the engine involved has twin cylinders and intake ports crowded closely together. Off-the-shelf Mikunis have throttle-stop and idle mixture adjustment screws on opposite sides of their bodies, so in a paired installation you're going to have one of each located between the carburetors. It's bad enough to have the big, easily-adjusted throttle-stop screw hidden away like that; the smaller, recessed mixture screw is a job for triple-jointed fingers and an unflinching indifference to skin/metal contact with the hot cylinderhead. Mikunis are made with mixture screws on the same side as their throttle stops, and you can save yourself a lot of agony by combining the two types in a twin-cylinder conversion, mounting them so that both idle mixture screws are pointed outboard. Unfortunately, the same-side models are not always available in the appropriate size.



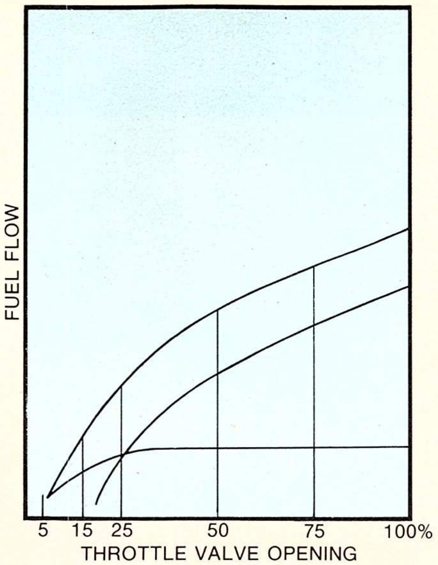
On the subject of throat size there is much to be said, but the important thing is that you do not get carried away. Never assume that bigger is automatically better, because it isn't and some of the problems of installing an oversize carburetor can make you wish you'd found some other occupation for your uncommitted evenings. The Mikuni is a sophisticated item, as motorcycle carburetors go, and it will for that reason do quite a nice job of metering fuel at through-throat air velocities lower than those required for most others. It isn't much better streamlined internally than the others, but there is an improvement in mass air flow to be had with a Mikuni carburetor a little larger than the unit it replaces. Mikuni's own tuning manual contains a chart with throat size plotted against horsepower per cylinder (on the basis of a carburetor for each cylinder) but that seems unduly conservative. My bike had 30mm carburetors; according to Mikuni's chart, reading up from its known bhp/cyl rating, it should have had carburetors with 28mm throat diameters. A set of 32mm-throat Mikunis were selected (partly on the basis of hunch; partly through calculation) and these provided not only a very noticeable improvement in performance at high revs—where it was to be expected—but also made the engine pull stronger mid-range and added about 1000 rpm at the bottom of the effective power band.

During the deliberations that led up to the choice of throat size numerous people expressed confidence that 34mm or even 36mm carburetors would be "just perfect." Perhaps, but there are compelling reasons for holding fairly closely to stock throat size in all except racing-only conversions. In four-stroke engines valve timing is arranged to suit a particular level of gas velocity in the intake tract, which implies that we should not too greatly alter port and manifold diameters unless we are prepared to embark on a complete engine redesign. And if the port and manifold diameters are to remain the same, then there hardly is any reason for fitting overly-large carburetors. You can expect that the flow capacity of the former will be greater, size for size, than the relatively "dirty" carburetor bore, and chose a throat diameter representing about 115-percent of port area, but that would seem to be a reasonable maximum. It is worth considering, too, that the process of determining suitable jetting, etc., will be much more difficult as throat size gets larger and air speed declines.

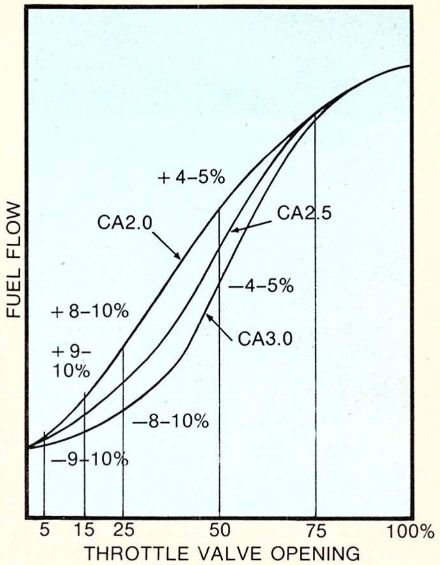
Two-stroke engines also respond badly to oversize carburetors, but for slightly different reasons. The problem here is that the window-valve wonders are extremely sensitive to any change in intake tract dimensions. They rely very heavily on inertia-ram and sonic wave effects to prevent back flowing during the period between TDC and intake-closing, and these effects are altered by changes in either diameter or length. You don't have to make big changes to find a difference: as little as 5mm in length, or 2mm in diameter, will sometimes do terrible things to intake tract tuning, and to performance. So if you have decided that you want a red-hot two-stroker and fitted a big, big Mikuni you'll need to re-tune the intake system. That job requires removing the engine's exhaust system—to eliminate exhaust-side pulsations that might otherwise confuse the picture—and trying different port window/manifold flange spacings until you find one that gives the best results. A rule-of-thumb to be followed in this is to make the intake tract longer by an amount equal to the square of throat size increases.

Entirely apart from the tuning difficulties, too-drastic increases in carburetor sizes bring with them some considerable practical problems. One of these is the matter of physical size, which already has been mentioned. Another involves the motorcycle's throttle actuating mechanism: throttle cables and their related fittings are far from being standardized, but the throttle-slide ends of Amal cables will hook up to Mikuni carburetors without difficulty. It's a quick, no-modifications linking of parts—unless there's a real disparity in original/replacement carburetor throat size. You really can't expect a throttle mechanism arranged to lift the slide above a 30mm throat to handle a 40mm lift. Peeling back the cable housing may provide enough slack to let the slide close; you still may have a problem with the twist-grip itself, if the drum that winds-in cable is too small in diameter and/or won't rotate far enough. Usually the problem is confined to drum diameter, and it manifests itself as a mournfully slow

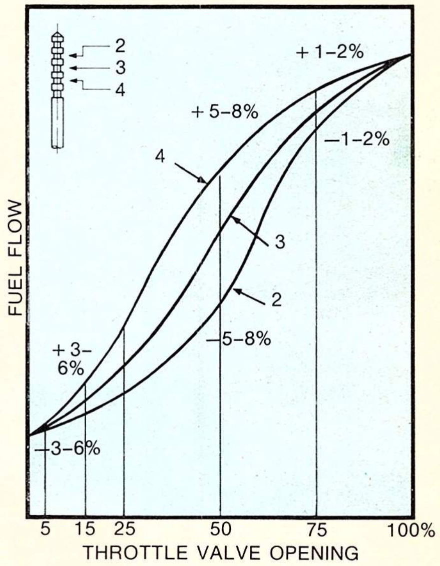
continued on page 97



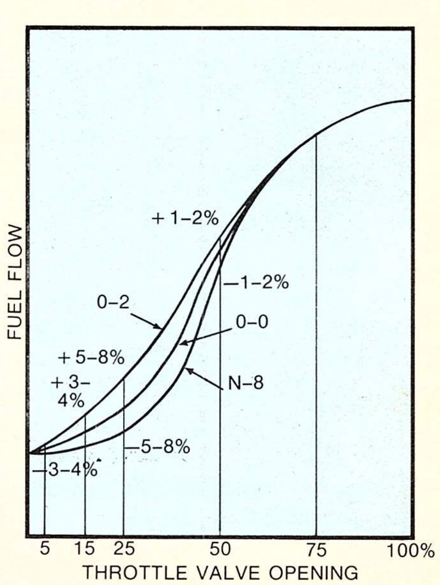
PILOT FUEL SYSTEM



SLIDE CUTAWAY



NEEDLE POSITION



NEEDLE JET

In general it may be said that the Mikuni carburetor's main jet size controls mixture strength when the throttle is fully opened. But an air jet is required to stabilize the air/fuel ratio over the broad range of engine speeds and there is the pilot jet adding its mite to the total fuel delivery. At anything less than full throttle other elements in the carburetor's two fuel metering systems become important and the overlapping influences of these elements confuse the tuning process. To clarify matters we present here a cross-section drawing of the Mikuni, and charts to show the fuel flow/throttle opening relationships for the carburetor's metering elements.

PILOT FUEL SYSTEM: *An adjustable air screw and throttle-slide-bypass hole brake fuel flow up through the pilot jet at idle, but there is a rapid rise in pilot system fuel delivery until ¼-throttle is reached. Fuel flowing up through the pilot jet combines with that from the main fuel system at larger throttle settings and changes in pilot jet size thus require an adjustment in the sizes of all the other metering elements—including the main jet.*

SLIDE CUTAWAY: *The chart shows the effects of 2.0, 2.5 and 3.0 throttle slide cutaways on total fuel flow with all other factors remaining the same. The cutaway's influence is slight above ¾-throttle; strongest around ⅓-throttle.*

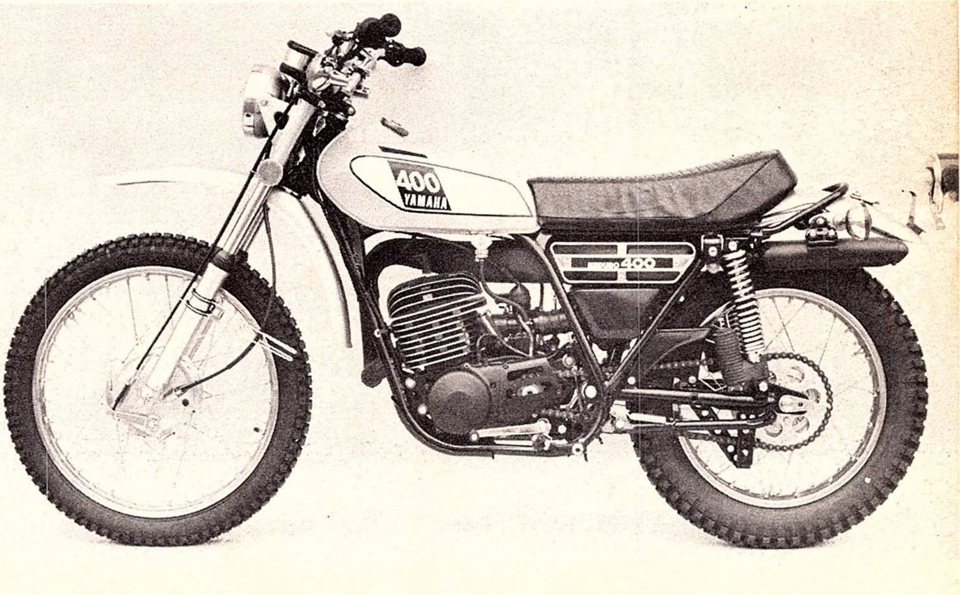
NEEDLE POSITION: *This is what happens when you raise or lower the tapered metering needle relative to slide position. The effect extends over the full range of throttle settings with the strongest response at the halfway point. There would be a shifting, higher or lower, of the whole fuel-flow envelope with multiple-taper needles.*

NEEDLE JET: *Of significance is the fact that virtually all the change in fuel flow is confined to the area below half-throttle, and that the needle jet numbers shown indicate a size spread of only 0.02mm in jet diameters.*

Cycle Test

YAMAHA DT400B

COLOR PHOTOGRAPHY: LARRY WILLETT



● The release of Yamaha's first enduro bike in 1967, the 250cc DT-1, signaled the beginning of a new era in motorcycling. The motorcycle, a completely street legal two-stroke single enduro bike from Japan, was all new and the design execution was amazingly accurate for this new marketplace. Earlier efforts, by Yamaha and other manufacturers, at building formidable combination street/trail machines were token efforts; the motorcycles were laden with heavy stamped steel frames, absolutely horrid suspension, pre-rotted rubber and barely serviceable engines. The DT-1 was the first honest Japanese effort at making a motorcycle equally dexterous in both riding worlds—dirt and street.

The buying public responded to the DT-1 by making it, overnight, the most in-demand motorcycle in this country. Other manufacturers responded one-by-one by duplicating the DT-1 concept with 250cc two-stroke single enduro bikes of their own. Even mighty Honda stereotyped the DT-1 six years later with their first-ever two-stroke trail bike, the MT 250. For the first time in memory some European concerns emulated the Japanese (Yamaha's) enduro bike concept in an effort to regain lost sales. The DT-1 pioneering success made Yamaha *the* force to reckon with in on/off road development.

The success of the DT-1 also shaped the future of Yamaha. While they have become the byword in roadracing, their major sales and product successes have been in the enduro and motocross market. In most instances manufacturers expand successful models by making them bigger and faster. But Yamaha did just the opposite; they made their enduro bikes smaller—from 175cc down to a 60cc. Not until 1970 did Yamaha make an enduro model larger than the original 250cc DT-1.

Yamaha believed there wasn't sufficient demand for enduro models above 250cc. Riders wanted more horsepower but not necessarily bigger engines. The 250 class enduro bike was (and still is) the most popular. Riders who once rode little trail bikes move up to 250s, and it's most popular with courageous first-time buyers.

The DT400B has all the credentials necessary to make it ideal for the grassroots neophyte as well as the expert enduro rider. The kick-crank actuated compression release takes the bite out of starting; the CDI ignition should never need timing or adjustment; the MX-copy chassis removes the evil from the handling; the gutty, flat power curve of the bigger engine requires no special skills to use to its fullest; and better balancing has produced an exceptionally smooth running big-bore enduro bike. *Cycle* called last year's DT360A "the best all-round big-bore dirt bike in town," and the new DT400B is markedly better.

Until the advent of the DT-1, Yamaha and other manufacturers (Japanese and European) stuck with two basic induction systems for the two-stroke single—rotary valve and basic three-port Schnurle loop. The rotary-valve system with a crankshaft-mounted timing disc and outboard carburetor promised the most power output. Opening and closing of the intake port could be controlled separately (unlike piston port) while the rear boost port of a rotary valve cylinder cleaned out the combustion chamber. But excess engine width of a rotary-valve single didn't appeal to Yamaha's design department. A narrow frontal profile was prime criteria

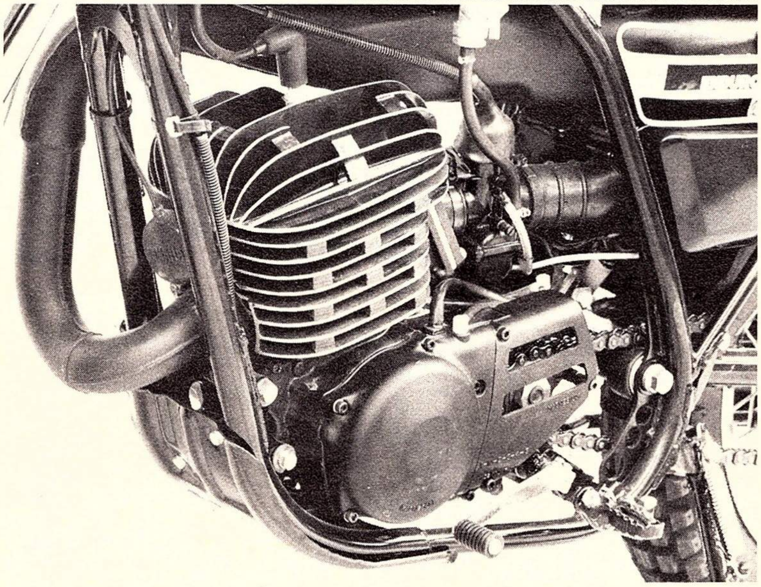
After selling over half a million enduro models Yamaha has produced the best dual purpose bike from the Orient. The DT400B engine is to trail riding what a locomotive is to train travel. If you ride it once you'll never settle for a smaller enduro bike.

in the original DT-1's concept.

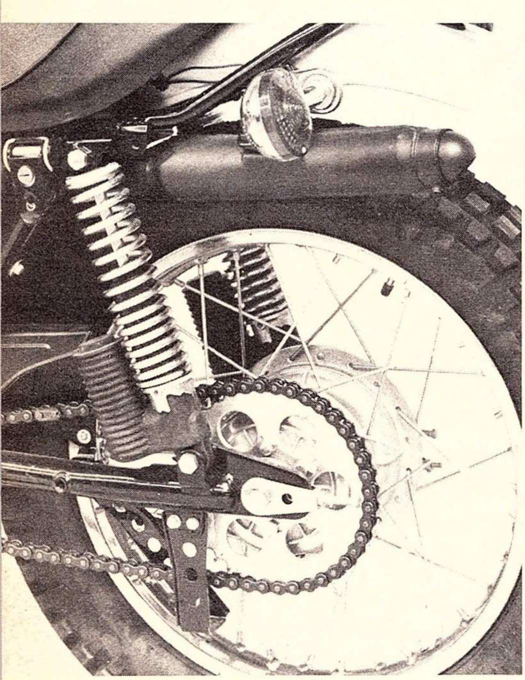
In 1966 Yamaha decided to build a piston-port single for their *new* enduro line. This decision committed them to improve or perfect the Schnurle loop system which would compete, performance wise, with stronger rotary valve designs. Earlier experiments with the original near-tragic 350cc twin street bikes proved that grinding two slots up the sides of the cylinder sleeve and adding matching holes in the pistons dramatically increased performance. These *fifth* ports (adding to the intake and two standard transfers) boosted some of the fuel charge flow to the rear of the cylinder to better cleanse the combustion charge by pressuring exhaust waste out the front.

The DT-1 came standard with *real* fifth ports. There were four transfer tunnels in the aluminum cylinder casting and a like number of window openings in the steel sleeve. The performance delivered by the original DT-1 engine was far ahead of its time. Despite its road equipment, the bike would go places only European enduro bikes could previously handle. With knobbies mounted and gearing lowered the DT-1 brought home many thousands of trophies for enduro riders in every part of the country. The new era began.

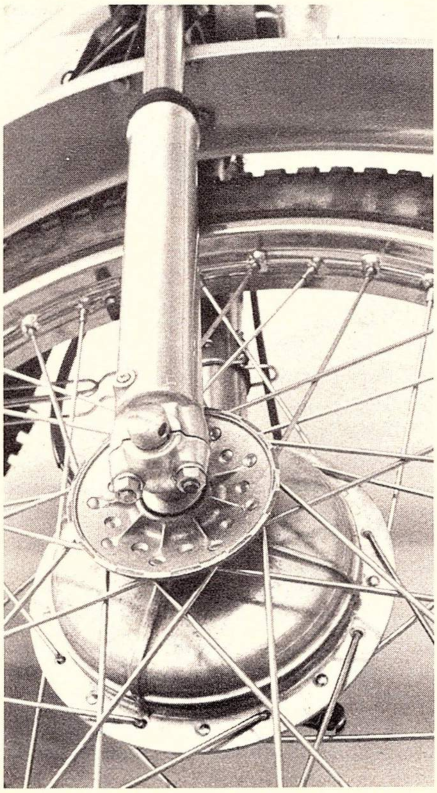
PHOTOGRAPHY: DALE BOLLER, DAVE HOLEMAN, BILL DELANEY



The heart of the DT 400B is its engine—gobs of torque with controllable power.



Shock springs are far too stiff; the brakes too grabby and the turn signals too vulnerable.



Conical style hub has a bigger brake and is too touchy. Fork action is good, springs bad.

The reed-valve induction now stands as Yamaha's backbone of two-stroke dominance. The reed-valve principle isn't new but Yamaha was the first manufacturer to perfect a petal acceptable for mass production. The stainless steel reed petal is simply a flapper valve located between the carburetor and intake tract. The reed petals rest flush against vulcanized (over aluminum) rubber to seal the crankcase area from the carburetor venturi. When the piston rises a vacuum is formed in the crankcase, the reed flaps are pulled open, and the fuel/air mixture is sucked into the big end. When the pressure cycle builds, the flaps close to seal the intake tract off. Holes in the back side of the piston match with an inverted T-shaped intake slot. The holes, when passing over the arms of the T-slot, prolong the intake cycle on the up-stroke of the piston. On the down-stroke, big-end pressure forces fuel up the leg of the T-slot which acts as an additional rear boost port as used in rotary-valve engines. The Yamaha reed-valve system while being functionally simple is mechanically complex.

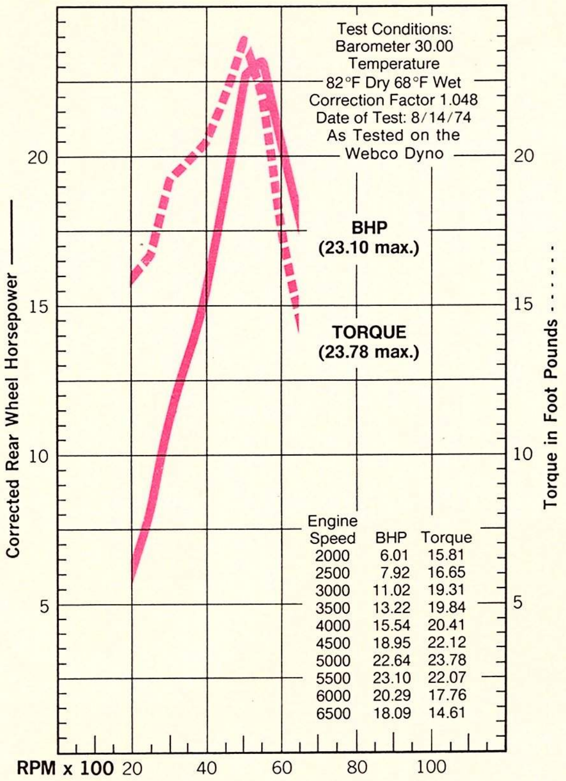
The reed-valve system acts as an intake timing device to better control fuel flow into the engine. The enormous amount of porting inside the cylinder lets the Yamaha engine develop more combustion efficiency from less contaminated (from exhaust leftover) fuel charge. The result is an engine that pulls like the proverbial tractor. Without question, the DT400B is the best enduro engine regardless of displacement from the Orient.

The Yamaha 400 enduro has the best Japanese engine for reasons beyond just power. It produces more torque than either the 400 Suzuki Apache or Honda XL 350 four-stroke—almost four foot-pounds more. The Yamaha also pulled Webco's dynomometer at a lower engine speed than either the Apache or XL 350. Starting off at 2000 rpm the DT400B runs smoothly but with a deliberate power rise up to 5500 rpm, then drops off slowly to 6500 rpm. It won't pull effectively past that.

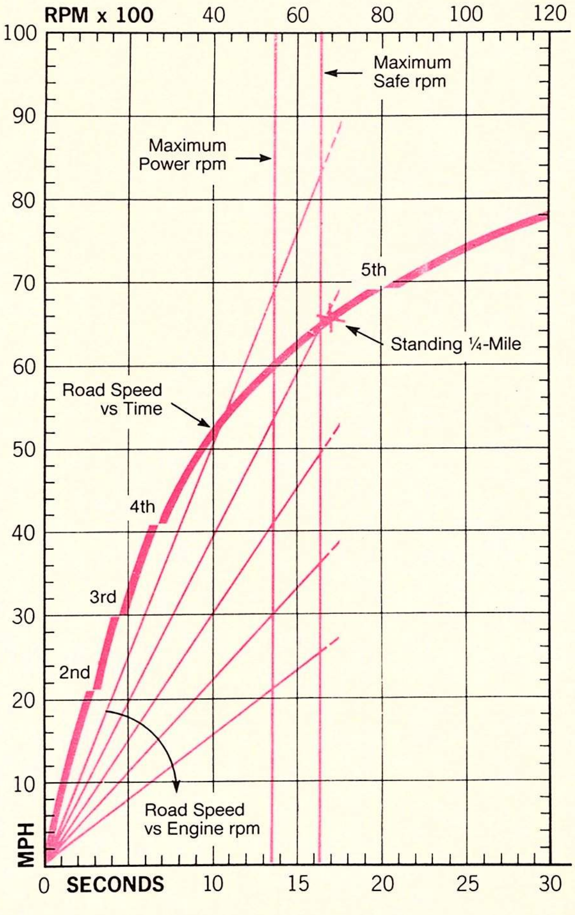
The ability of the engine to pull effortlessly at extra-low crankshaft speeds is the result of Yamaha's mechanical wizardry. Perfecting of the reed valve system is aided by care to other performance related areas. The top piston ring appears to be a conventional Dykes type, but it is actually an L-shaped Keystone loop. The Keystone ring is tapered towards the center seven degrees on its bottom side. This taper matches the machined offset in the piston ring groove. The outwardly tapered ledge of the groove allows the ring to be pushed away from the piston as combustion pressure drives down on the L-pocket. As a result the ring snugs tighter against the sleeve on the power stroke; this gives less blow-by and produces slightly greater efficiency.

YAMAHA DT-400B ENDURO

Price, suggested retail	$1371
Tire, front	3.00 x 21″ Dunlop Trials
rear	4.00 x 21″ Dunlop Trials
Brake, front	1.00 x 6.3 (25.4 x 160mm)
rear	1.075 in. x 5.91 in. (27.3 x 150mm)
Brake swept area	39.75 sq. in.
Specific brake loading	12.42
Engine type	Two-stroke reed valve single
Bore and stroke	3.35 x 2.8 in. (85 x 70mm)
Piston displacement	24.22 cu. in. (397cc)
Compression ratio	6.4:1
Carburetion	1-32mm; Mikuni
Air filtration	Oil soaked foam
Ignition	CDI
Bhp @ rpm	23.10 Bhp @ 5500 rpm
Torque @ rpm	23.78 ft. lbs. @ 5000 rpm
Rake/Trail	30°/5.1 in.
Mph/1000 rpm, top gear	12.7
Fuel capacity	2.4 gal. (9 liter)
Oil capacity	1.6 qt. (1.5 liter)
Transmission oil capacity	1.1 qt. (1 liter)
Electrical power	Flywheel ac generator
Battery	6v-4ah
Gear ratios, overall	(1) 19.302 (2) 13.634 (3) 9.938 (4) 7.619 (5) 5.841
Primary transmission	Helical spur gear 2.666:1
Secondary transmission	#520 D.I.D. chain 2.857
Wheelbase	56 in. (142cm)
Seat height	32 in. (81cm)
Ground clearance	9 in. (23cm)
Curb weight	294 lbs. (133kg.)
Test weight	494 lbs. (244kg.)
Instruments	Speedometer w/tripmeter, tachometer
Sound level (California Standard)	83.5 dB(A)
Standing start ¼-mile	16.53 sec/74.50 mph
Top speed	87 mph indicated
Average fuel consumption	32 mpg



Engine Speed	BHP	Torque
2000	6.01	15.81
2500	7.92	16.65
3000	11.02	19.31
3500	13.22	19.84
4000	15.54	20.41
4500	18.95	22.12
5000	22.64	23.78
5500	23.10	22.07
6000	20.29	17.76
6500	18.09	14.61



The cylinderhead this year is radial designed for less weight and better cooling. The compression ratio remains the same as last year's—a mild 6.4:1. The low compression permits use of low octane fuels. The entire engine is coated in a gloss black for appearance, not cooling.

Besides the radial head, the other major change to the DT400B is the 5mm larger piston which raises the displacement from 352cc to 397cc. The DT400B boasts a monster 85mm bore and 70mm stroke. The Mikuni carburetor this year is nominally 2mm bigger at 32mm. The oil injection tube runs into the carburetor venturi rather than the cylinder's intake casting. Invisible modifications have been made to the internals of the muffler and its baffles for the larger engine. The spark arrestor has been pulled outside of the fender well further to permit clearance for a big 4.50 knobby.

The broadly spaced five-speed remains the same. Robust gears, shafts and a trio of hardchrome-tipped shift forks assure dependability and positive gear changes. The clutch is slightly different with the DT400B. Yamaha narrowed the left case cover by removing one friction plate from the old 14-plate clutch. Also, the all-metal plates were thinned slightly and new material is used.

Other than a re-designed gas tank shape and color scheme the 400 enduro appears identical to last year's 360 model. The frame is the same mild tubular steel unit and retains the 30-degree fork angle and 5-plus inches of trail. The fork is also a pickup from last year; it retains the triple progressive springs that start out with 15 pounds-per-inch pressure, moving up to 21 ppi and coil binding at 28 ppi. The front hub is newly designed in a conical shape and the brake is slightly larger.

The back wheel assembly and swing arm remain unchanged. The big aluminum hub is quite strong. The rear sprocket is a smaller 38 tooth circle compared with the 44 cog wheel used last year. The secondary ratio was 2.933; now it's up to 2.533. Each of the aluminum bodied Thermo Flow shocks are sprung with a single progressive wound spring rather than the double paired coils previously used. The rate for the paired springs was 80 ppi for the short coils and 145 ppi for the larger. The new progressive wound spring is rated the same.

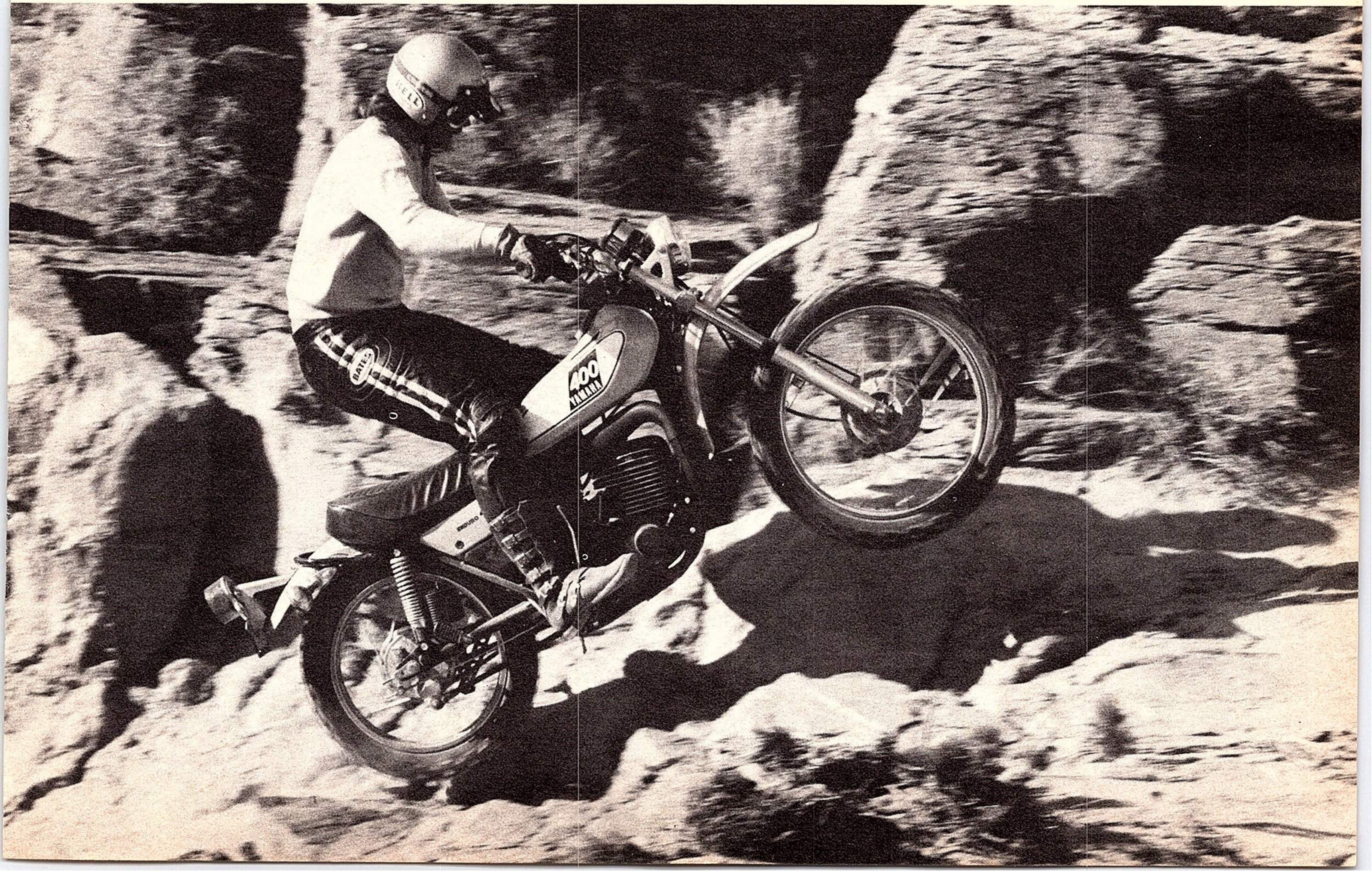
Ignition spark is again generated by the Mitsubishi CDI unit with external flywheel. Electrics are all six volt; an A.C. flywheel magneto generates the electrical power. The oiled foam air cleaner is hidden in a metal box behind the carburetor. The oil tank, battery and tool kit rest under the hinged saddle.

There are certain reactions we expect from any big-bore single. A lot of kicking pressure is one. However, Yamaha has nearly eliminated this by perfecting its decompresser which is actuated by the kickstarter. As the kickstart lever is pushed down, a small rocker arm follows a cam-like detent on the ratchet wheel. The arm pulls on a cable which opens a minute valve. This valve assembly is screwed into the top front of the cylinder. The tiny exhaust valve has a special outlet passage that breathes into the exhaust port so that no mess spews out of the engine. The valve setup substantially reduces the compression at the kickstart lever; the 400 kickstarts like a 250.

On the DT400B the self-actuating compression release works better than any on the smaller 360s. There's seldom any kick back. Matched to the easy kicking aid is an electronic advance system in the CDI ignition. A thyristor placed in the ignition circuit holds the spark retarded until 600 to 800 rpm whenit automatically advances the timing. Primary current for the ignition comes from a source coil in the flywheel generator and not the battery. If the battery fails the ignition won't quit.

While the compression release system works perfectly, the CDI ignition is far less developed. Starting the DT400B isn't as easy or quick as it should be. When cold (choke on, throttle closed) the engine will usually start in two or three kicks. Sometimes it takes ten swipes at the kick arm while opening and closing the throttle and fiddling with the choke. When hot the engine either starts first kick or a dozen stabs later. It lacks any predictability. Our lengthy experience with the

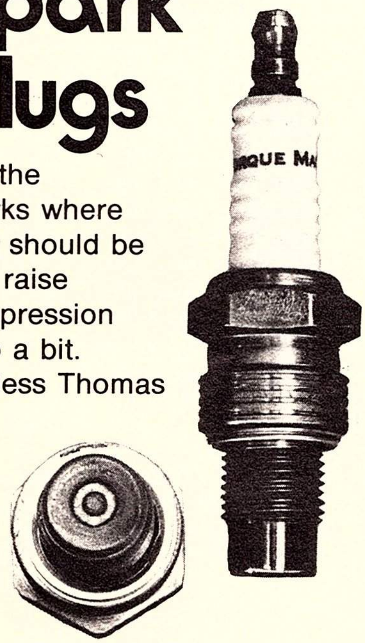
(Continued on page 94)



Torque Master Spark Plugs

Put the sparks where they should be and raise compression ratio a bit.

By Jess Thomas

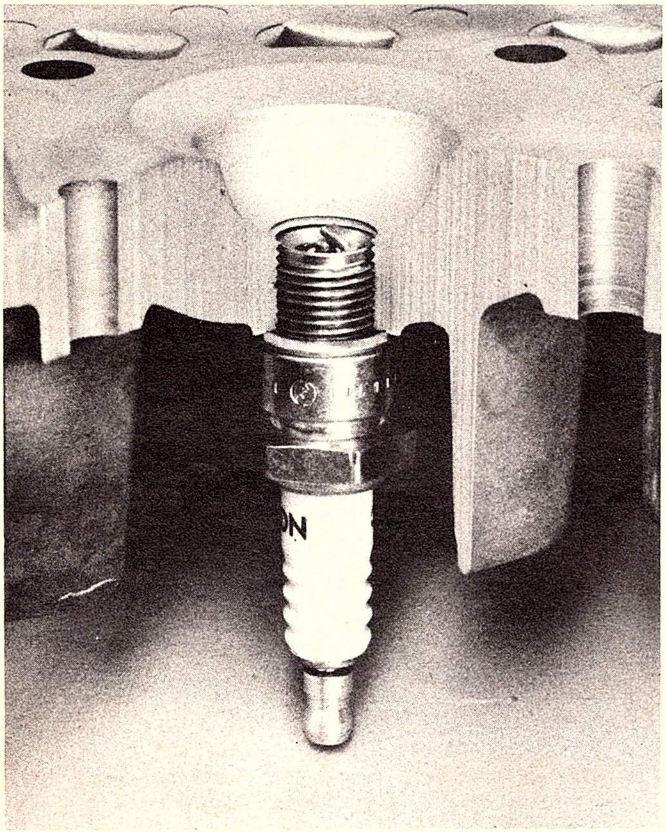


● Maurice Lindsay has developed a surface gap spark plug which projects into the combustion chamber. Sold under the trade name "Torque Master," these plugs were designed primarily for two stroke engines with short reach (7/16 to 1/2-inch) spark plug ports. Projected tip spark plugs of the common single-wire ground electrode variety are nothing new. Champion's Y-suffix series and NGK BP-prefix projected tips (along with corresponding models from nearly all plug manufacturers) have successfully survived extension into the chambers of two stroke bikes for years. These projected tip plugs worked well in many bikes, such as enduros and cow-trailers, which were operated at constantly changing throttle openings with only short bursts of full throttle. The flow of fresh inlet charge cooled the electrodes sufficiently to prevent pre-ignition and they were very resistant to solid bridging across the electrodes, or "whiskering" as it is called.

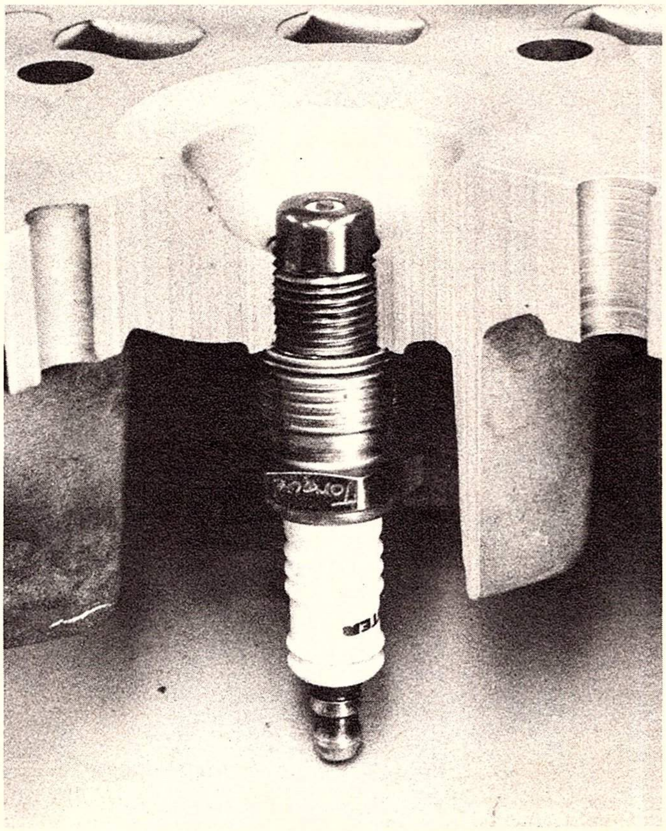
Then even casual dirt bikes began to develop so much power, hence heat, that the extended tips began to create as many problems as they solved, and the major plug makers developed the wide heat range series which featured relatively cold, or quick heat transferring, insulators balanced by gold or palladium or platinum alloy electrodes which require far less electrical energy to make a spark than the common nickel or copper alloy electrodes and are therefore more resistant to fouling.

I was dubious about the Torque Masters when they first showed up at the shop. Someone is forever coming along with some little gadget that supposedly cures everything from worn-out rings to psoriasis. Then this kid came rattling by one day, looking as close to Peter Fonda as he could manage and riding the most decrepit 500 Kawasaki triple still running. He was over from Hawaii on a trip of self-discovery, making The Great American Crossing. Anyway, Otto Heye had three Torque Masters screwed into his old Kawasaki and had ridden some 4800 miles without changing or cleaning them. Prior to that, he had fouled the standard plugs "about every 600 miles." I rode the bike and it ran quite well, though sounding as if it was going to burst at any moment.

During the test of the Suzuki 500 Titan twin for the February '74 issue, the plugs were tested both on the road and on the Webco dynamometer. As you see in the comparison chart, the largest gain was made near and after the torque peak. And the power seems to hang on better: at 7000 rpm the stock B77HC NGKs fell to 30.0 bhp, while the Torque Masters held on for 31.69 bhp. At the strip, the dyno figures translated to an average advantage of 0.15 seconds elapsed time and 1.87 mph. Of additional significance was the fact that the cylinder head tempera-



Cutaway section of cylinder head shows how stock short-reach plugs fit. They spark in stagnant fuel/air layer and lose power to heat and time.



Torque Masters should stick at least this far into the chamber. A better arrangement is to have threads flush if piston clearance is okay.

ture ran 65°F. cooler with the Torque Master plugs.

Testing on subsequent bikes proved that some engines are much more sympathetic to the Torque Master than others. The Yamaha MX175A, when fitted with a specially machined short reach head, the 250 Penton Hare Scrambler, and a 250 Maico MX all suffered about as much power loss as the Suzuki 500 twin gained. A Kawasaki 175 F7 enduro, a 750 Kawasaki triple, and a 185 Suzuki enduro all showed definite power increases and cooler running engines with the Torque Master plugs. All these test bikes were set exactly to their manufacturer's specifications for control runs, and then slight variations were made in carburetion and spark timing. Without exception, the engines which did respond to the Torque Masters ran cooler and developed more power with the needles dropped (mixture leaned) one notch, the main jets reduced one size, and the ignition timing retarded 0.5mm from the settings which produced best power from the standard plugs. When riding the bikes in their natural environments with the dyno settings, we could not hear any detonation rattle at any time.

The pattern which emerged from engines which responded favorably to the Torque Masters was thus: moderately tuned engines with compression ratios less than 7.5:1 (actual, corrected to exhaust opening) responded better; engines with at least 2mm (.080-inch) clearance between the end of the installed Torque Master and the piston at top dead center responded better; and engines without rear boost ports in the cylinder which direct a portion of the fresh charge toward the spark plug responded better.

In order to experiment with Torque Masters in two strokes with long reach heads (3/4-inch or 18mm), some tuners have relieved the combustion chamber to allow the smooth nose to protrude into the chamber rather than mill away the top of the plug port from the outside. Some people reported good results from this method, but I was unable to find any documented test data to back up their experience. From my experience, it would be better to establish the piston-to-plug nose clearance at 3mm (.120-inch) and then cut from either or both ends to gain the necessary protrusion and thread depth. As combustion chamber shape has a great influence on engine behavior, I would caution anyone to think twice before cutting into the combustion chamber of a long reach head unless their goal is to detune a racing bike to make it a more docile and reliable play bike.

Engine rpm	Stock NGK B-77HC HP	 Torque	Torque Master HP	 Torque
2000	5.56	14.60	5.60	14.73
2500	8.76	18.41	9.02	18.95
3000	12.34	21.62	12.45	21.79
3500	15.60	23.40	15.79	23.70
4000	19.25	25.27	19.02	24.98
4500	23.21	27.10	23.31	27.21
5000	26.18	27.51	26.40	27.74
5500	29.06	27.75	29.62	28.29
6000	32.73	28.66	33.64	29.44
6500	32.78	26.48	33.97	30.59
7000	30.00	22.51	31.69	23.77
7500	26.22	17.92	26.87	18.36
8000	21.08	13.84	23.01	15.10

Another distinct influence on the performance of Torque Masters in an engine is the basic capability and state of maintenance of the ignition system. Spark plug manufacturers commonly advise that surface gap plugs will only operate satisfactorily with capacitive discharge systems which have as high as 36,000 volts of electrical pressure at the spark gap. Even then, the plugs gave problems. Kawasaki recommended NGK BUHX surface gaps for the CDI equipped 500 triples for a while. But it was found that the plugs ran too cold during cruising to keep short-circuiting deposits from collecting on the electrodes. Then, when the throttle was opened for a burst of speed, the resistance would be high enough to cause misfiring. Even under otherwise perfect conditions, using an oil that did not burn cleanly would cause misfiring after four runs through a quarter-mile strip. Though the Torque Master protrudes into the combustion chamber far enough to keep the deposits burned off, it is necessary to keep magneto and battery-coil systems perfectly tuned. During starting, the Torque Masters require much less choking than normal plugs, and they will cause a cold engine to run much smoother on a lean-starting mixture. Our production editor does not have much bike experience and has not developed "an ear" for when it is time to off the choke. While riding the Suzuki twin, he was very prone to wet fouling the Torque Masters in the morning. Experienced motorcyclists will have no problem wet fouling Torque Masters if they keep their ignition systems maintained properly.

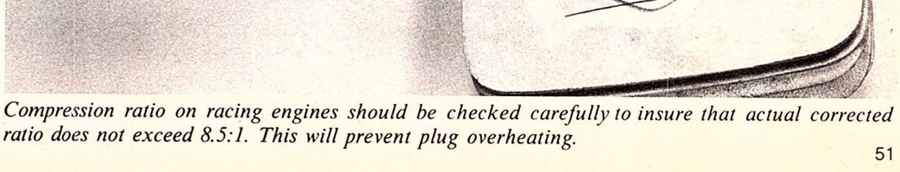
Hard fouling is another problem. This phenomenon occurs when an electrically conductive substance becomes coated on or between the electrodes. The plug will look normally dry and colored but it will not make a spark. This happened twice during our testing: once when we got a bad batch of gas in the Suzuki twin during the fuel crisis, and again when we were experimenting with ignition timing on the Kawasaki 175 enduro. With the Kawasaki, I had advanced the timing 6 crankshaft degrees and the engine was detonating badly under full throttle hillclimbs. Both plugs were cleaned on service station sand-blast type cleaners and continued to perform well after the gas was changed and the ignition was retarded to the original position.

My initial experience with the Torque Masters was encouraging enough to prompt investigation into the source of their benefits. Whenever a string of observations begin to assume a pattern, I, along with many professional engineers of my acquaintance, always reach for what is affectionately known as "Uncle Harry." Uncle Harry is a book titled: *The High Speed Internal Combustion Engine.* In England, his homeland, the author is known as Sir Harry R. Ricardo, LL.D., F.R.S. First published in 1923, this volume of 420 pages was last re-written and added to in 1955. You won't find the ultimate port timing for a Husqvarna in this little bible, but you will discover what an inquiring scientist has found out about how different types of engines respond to variables in tuning.

The main reason for sticking the spark down into the chamber is to place combustion ignition in a more turbulent stream of vaporized fuel. Fuel and air tend to be rather stagnant near the surfaces in the cylinder and especially in the tops of deeply recessed combustion chambers. A flame front initiated in such a barely moving fuel mixture propagates very slowly in its beginning and therefore must be ignited at a piston position (or crankshaft angle) earlier than would give best thermal and mechanical efficiency.

For any given set of engine characteristics, maximum cylinder pressure must

PHOTOGRAPHY: DAVE HOLEMAN



Compression ratio on racing engines should be checked carefully to insure that actual corrected ratio does not exceed 8.5:1. This will prevent plug overheating.

not be developed prior to a crankshaft angle which would most advantageously convert that pressure to torque. It must be remembered that with maximum cylinder pressure comes maximum combustion heat. If the crankshaft/connecting rod relationship is not ready to convert the pressure into torque, then the cylinder and piston are exposed to the intense heat for more time. Obviously anything that can be done to cause the fuel to burn faster, without reaching the dangerous state of detonation, will be beneficial in terms of less heat input to the mechanical parts of the engine, less pressure loss due to the heat loss, and higher initial compression due to a delay in ignition. With the limitations imposed by gasoline, the pressure rise in modern engines is held to the range of 30 to 35 psi per degree of crankshaft rotation to avoid trouble with detonation or rough running.

Turbulence in the combustion chamber, mixture strength (in terms of fuel/air ratio), compression ratio and spark temperature are the variables which go along with spark location to determine the crucial rate of propagation for that first little fire ball in the cylinder. Too much or too little of any of these variables at the wrong place will spell trouble at the extreme and loss of efficiency either side of optimum.

Another factor of combustion control has been largely ignored as being insignificant in this country. It is a well established fact that a richer mixture is required to establish acceptable initial ignition burning rate than will give good performance and best economy after the flame is well started. Despite the age of this knowledge, Honda has only recently developed the usable technology to implement it with their CVCC stratified charge engine. This engine does start the flame front with a relatively rich mixture in a small pre-combustion chamber and then feeds the fire with a leaner mixture from a separate carburetor. This system gives better fuel economy and results in a markedly cleaner exhaust gas without the need for bulky exhaust treating machinery. A French firm, Motobécane, has recently patented a direct-cylinder fuel injection system which reportedly accomplishes the same effect for two-stroke engines.

The fact that Torque Master spark plugs will give slightly increased engine output on many bikes at leaner mixtures and retarded spark settings and lower cylinder temperatures indicates that they do ignite a more efficient fire than do standard equipment plugs. Time limitations and a lack of accurate test equipment prevented any reliable fuel consumption and exhaust gas analysis for this article. I hope to be able to do this measurement in the near future, as we are toying with the possibility of getting our own dyno and accessory toys.

Though Torque Master users have reported their beneficial use in long reach (17mm and 3/4-inch) heads on both two strokes and four strokes, we have no direct experience with such success. Indeed, there are good reasons why the plugs should not be used in long reach heads. During operation, carbon will slowly build up in the exposed threads and a long reach plug will not be insertable until the threads have been cleaned with a thread chaser of the correct design. Many 14mm spark plug taps will remove additional aluminum when used to chase existing threads. The threads will thus be easier to strip and will not conduct heat as well. Good quality thread chasers are sold at auto supply stores: there is a good one on the K-D tool bubble-pak display. If you want to try a surface gap plug in a long reach head, try one of the standard ones produced by the big plug makers.

Although the Torque Masters are not a magic cure-all, they are definitely worth trying within the bounds of our experience and your good sense. At $5.75 for one, $10.50 for two, and $5.00 each for three or more, they are not cheap, but for the present they are being hand made from the components of new plugs from the big manufacturers. In the near future, Lindsay hopes to complete negotiations for complete private manufacture of the present Torque Master and further developments. Torque Master Products' address is: 114 Standard St., El Segundo, Ca. 90245. A descriptive brochure is available. ◉

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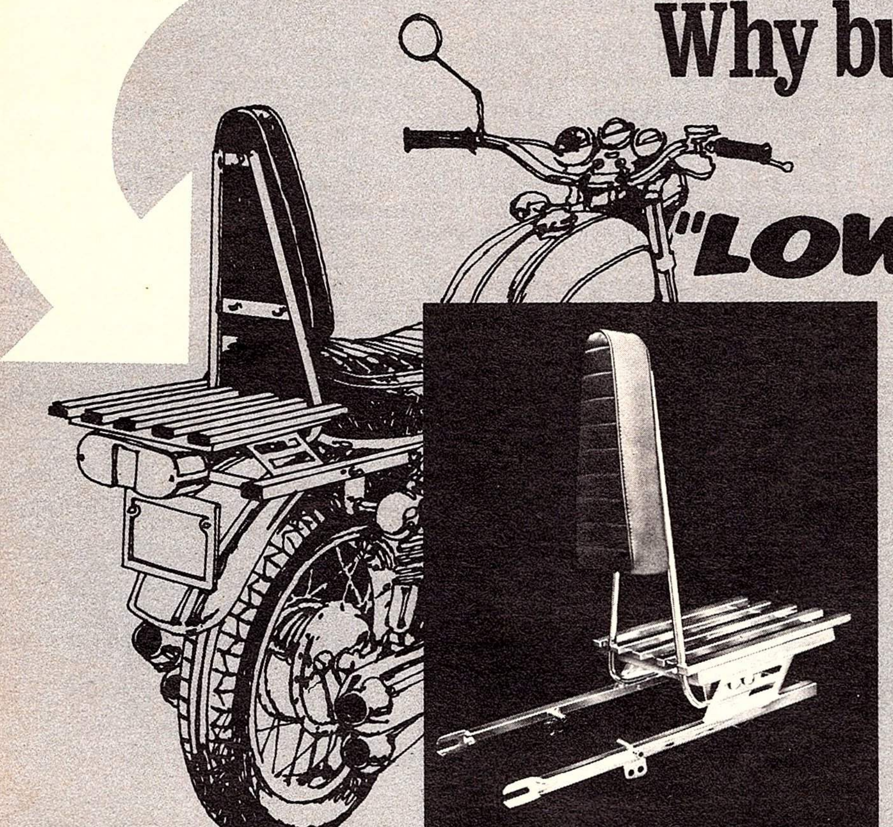

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Ten Muzzlers for Two-Stroke Barkers

THE SILENCER PAPERS

Trapp Std. & Comp.
Fun 'N Fast
Bassani
J&R

Skyway 74 & ALD
Xdusor II & S
Std. Honda
Murphy

By Jess Thomas

PHOTOGRAPHY: DALE BOLLER, BILL DELANEY

CIRCLE NO. 32 ON READER SERVICE PAGE.

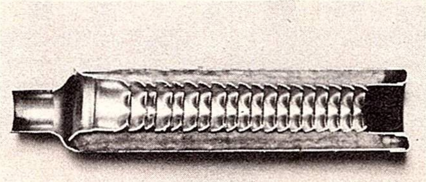
● For all the models and wide price range of the bolt-on silencers and silencer/spark arresters available, there is precious little offered in the way of specific information to go along with the gadgets. A local dirt squirter, either conscience-stricken or hassled by his neighbors or the cops, must go to the dealer, pay his money, and take his chances. For him the outcome is straightforward: either the bike is quiet enough to appease the complainers or it isn't. But for the competition rider things are more complex. A racer must know how the device will affect the power curve of his engine.

To give the reader some idea of how the various bolt-ons affect the performance of a bike fitted with an otherwise open racing expansion chamber, *Cycle* engaged in a lengthy series of comparative tests. The participants were contacted and asked to submit the same bolt-on silencers they offer through retail dealers. To guard against any bet-hedging, the submitted units were checked against ones on the shelves of local dealers. For a machine to test the units on, we chose the most popular 250cc motocrosser in the country: the Honda CR250 Elsinore. American Honda loaned us one of their completely stock magazine test machines. A mixture of Union 76 Premium gasoline and Klotz Special Formula Synthetic lubricant in a 20:1 ratio was used for all the tests. Twenty-seven runs were made on Webco's Schenck Eddy Current Dynamometer. Control runs were made with Honda's silencer, with no silencer, and with Honda's silencer in conjunction with the tailpipe stinger shortened 4.5-inches. All the other models and variations were tested with both standard and shortened stinger. With Honda's standard arrangement, the stinger protrudes about halfway through the silencer and we wanted to determine just how much tuning difference the resulting masking made. The Union 76 fuel cured what was initially a sour-running engine.

Many dynamometer tests are made with the throttle open at all rpm settings. For our runs the throttle was varied to produce maximum power at all rpm settings in the same way that a rider would while on a race course.

FUN 'N FAST. Like all the straight-through-type silencers, the Fun 'N Fast is a variation of the original expansion chamber quieter, the V-W muffler tip. A one-piece steel tube is used for the body of the silencer and one end of the tube is swaged down to form the clamping neck for the expansion chamber. The other end is left open to accept the core and fiber glass packing. A formed cap holds the core in place and is secured by a single sheet metal screw. All of two minutes is required to replace the packing after removing the screw and pulling off the cap. Sound waves bounce along six rows of raised-edge cuts in the core tube. A smoothly flaired inlet end on the core tube permits an easy transition of gas flow from the clamping neck. A single stainless steel hose clamp is supplied with the silencer to secure it to the expansion chamber stinger. An additional mounting clamp (which fits around the silencer body) is available, but not supplied. During the dyno and field test runs the Fun 'N Fast silencer was held only by the single hose clamp, and it never fell off.

Fun 'N Fast

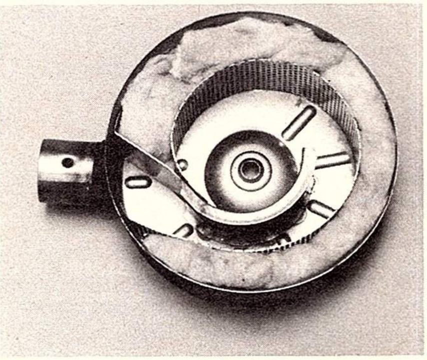


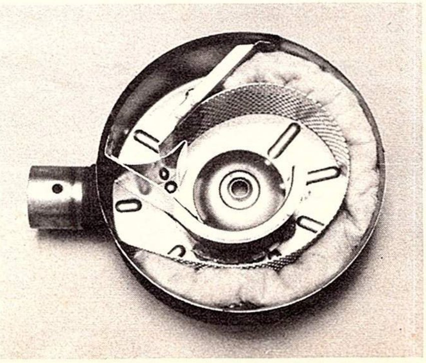
As may be seen on the dyno charts, the Fun 'N Fast preferred to be clamped to the end of the full-length standard Honda stinger, where it produced very slightly less power up to 7500 rpm and very slightly more in the last usable thousand revs when compared to the standard Honda fitting. (It is extremely interesting to note that the standard Honda muffler performed better than the bare Honda expansion chamber.)

The gloss black paint on the Fun 'N Fast is very durable and does not rub off when hot. List price is $10.75 from Fun 'N Fast, 18143 Napa St., Northridge, Ca. 91324.

DISCOJET CORPORATION. This aerodynamic R&D company markets both Xdusor and Trapp brands. Xdusor is a flat-sided, pan-shaped device and is available with an integral spark arrester in the Xdusor II model and as a silencer only when called the Xdusor S. Inside the Xdusors is a swirling, snail-shaped expansion chamber which is lined with perforated steel sheet. The volume between the perforated membrane and the curved wall of the pan is filled with fiber glass which has been treated with a special high-temperature binding agent to prevent the fiber glass from blowing out. As the gases expand at the center of the pan and lose enough speed to make a turn, a series of radial vanes in the removable side cover guides them out to atmosphere around the whole circumference. In the Xdusor II, an additional chamber at the end of the expansion membrane catches the heavier glowing carbon particles when they are centrifuged to the outside and before they slow enough to exit with the gases. Both Xdusor models may be fitted with one of four available different-thickness "tuning reeds" which meter the flow of gases through the cover plate passages.

Xdusor II & S





Both model Xdusors are made with a single standard-size inlet tube (1.175-inch I.D.), and separate adapter couplings must be bought to fit individual exhaust system ends ranging from ¾-inch to 2-inch O.D. Another option, a center mounting support kit, provides much more secure mounting and extends the guarantee to six months. Both the adapter and the center mount are insulated with high-temperature and vibration-resistant silicon rubber bushes. A hose clamp fastens the adapter to the bike's tailpipe and a big cotter pin through the center of the tubes connects the adapter and silencer in a sort of pivoting live mount that stays gas-tight. Xdusor mounting is sound, if visually peculiar, when both adapter and center mount are used.

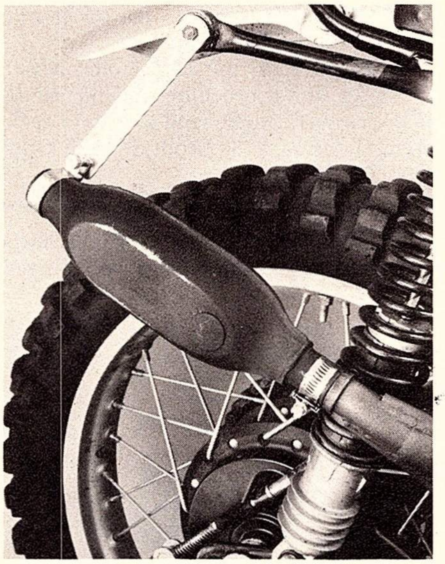
Maintenance kits for the Xdusors include fiber glass packing, an 8 mil reed, a new cotter pin, snap plugs, a carbon scraper, and a molded silicon rubber bush for the adapter. Retail price of the kit is $1.75. Strength problems dictate that the fiber glass repacking hole be limited to ⅞-inch diameter. That means the old glass must be dug out with a length of stiff wire and the new glass stuffed in bit-by-bit. The whole act can be completed in a half-hour or so, but the replacement glass cannot be treated with the original high-temp binder and will blow out sooner. Oil saturation is about co-evil with temperature and vibration as far as packing life is concerned. If an excess of dirty-burning oil is used in a bike, the packing will have to be replaced fairly frequently in order to maintain muffling and/or spark arresting. The outer lid of the Xdusor is crimped to the body much like a food tin can. Along with the test units, Discojet furnished us with some uncrimped ones for photography. The uncrimped ones could be repacked quickly and thoroughly, but a Discojet representative said that the uncrimped assembly was not rigid enough to survive hard usage.

Xdusors do strange things to the power curves of high-speed motocross engines. Of all the combinations of Xdusors and pipe lengths, with and without reeds, the Xdusor II (spark arrestor model) (without reed and mounted on the end of the full stinger) produced the most potent power curve; it was significantly better than any of the stock Honda combinations. Installing the reed is supposed to be a compromise in terms of power so that a quieter exhaust may be obtained. The noise aspect will be discussed later, but the reed so smooths out and extends the power range that it could produce better lap times on slick tracks, either muddy or hard, where the tire cannot get maximum traction. Both models worked best with the full stinger; the S produced a slightly better curve.

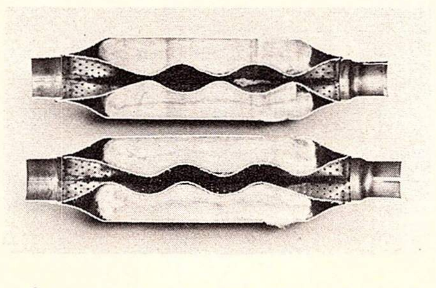
Discojet also produces the Trapp silencers, both in Competition and Standard models. Trapps are similar in design to the other brands of perforated-tube-surrounded-by-fiber glass silencers, and their resulting orthodox appearance is probably the main reason they were developed. The Trapps require the same probe-and-tuck methods for placing the fiber glass as the Xdusors. The rebuild kit has new plugs as well as glass, and sells for $1.25. Gloves should be worn anytime spun fiber glass is handled, for the tiny particles tend to embed in the skin and cause a lot of scratching and swearing.

Trapps come in exact sizes to fit individual stinger diameters and are attached to the pipe with hose clamps. Auxiliary rear mounting kits are available for $1.50 and are strongly recommended. The flat-black paint on both Trapps and Xdusors rubs off easily when they are hot.

Instead of being a straight shot through the center, the Trapps have undulating tubes. The only difference between the two models is that the undulations coincide in the Standard and are staggered in the Competition: a construction which gives the Standard a couple of mini-expansion chambers and the Competition a constant-area section.

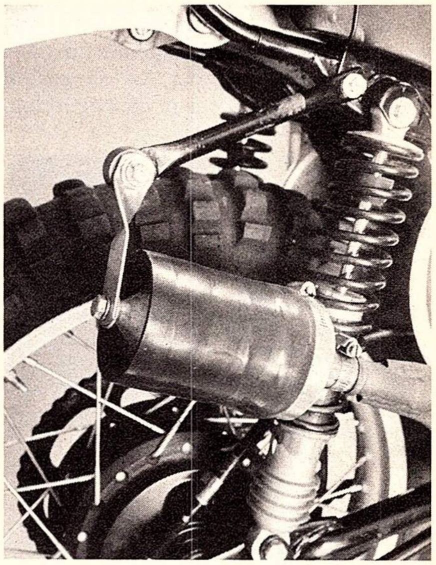


Trapp Std. & Comp.

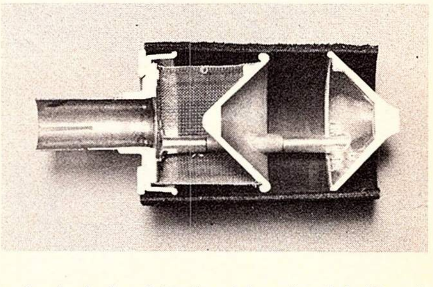


Surprisingly, the dyno showed that the Standard fitted to the full stinger produced the best max-power curve, while the Competition on the shortened stinger gave a more flexible spread. Even more intriguing was the inability of either to come near matching the Xdusor II. List prices for the Discojet models are: $14.95 for the Xdusor S, $16.95 for the Xdusor II, and $13.95 for either Trapp. Discojet offers a ten-day money-back dissatisfaction refund if the model in question was designed for your intended use. The replace-or-repair guarantee is good for 60 days, provided the Xdusors are mounted with the optional adapter, and all units are extended to 6 months when the optional seconary mounts are used. For brochures listing dyno and sound tests on other machines and the address of your nearest dealer, write Discojet Corp., 920 3rd St., Davis, Ca. 95616.

MURPHY MUFFLER. Murphy is the hands-down winner of the most unusual design award. Four separate aluminum castings, surrounded by a length of silicon rubber hose, are fastened together with three long screws. Exhaust enters through a steel tube cast into the aluminum body and goes into a primary expansion chamber. This chamber is surrounded by a stainless steel screen cylinder which is fine enough to break up and filter any glowing carbon sparks. A cone in the back of the chamber directs the gases outward through the screen to force the hose to expand and let them pass. A secondary resonance chamber allows some additional noise dissipation before the gases again bulge the hose away from the body to escape.



Murphy



Included with the Murphy Muffler is a roll of pink silicon tape. After the stinger is washed and dried, the tape is wrapped around the tube until the muffler tube will barely slip on. A hose clamp around the muffler tube fastens the Murphy in place. A heavy boss is provided in the end cone of the muffler for the installation of a secondary mount. We drilled and tapped this boss to accept an M8 x 1.25 bolt (5/16-inch x 18 alternate), and used one of Discojet's kit straps for the mount. No problems were experienced with the mounting, although the silicon tape tended to wad a bit before the burr was carefully removed from the end of the mount tube with a piece of emery cloth.

Because of its modular construction, the Murphy is obviously easy to take apart for cleaning. A replacement length of hose is $7.45, the silicon tape goes for $1.50 and a new spark arrestor screen costs $3.75.

The dyno charts show that the Murphy is average in developing a good usable range of power, with the tendency to be a little low at low revs and to hold out well at its peak in a gradual drop. The long stinger gave a more gradual climb in power and reached a slightly higher peak, while the shorter stinger produced an opposite trend. With a retail price of $32.95, the Murphy, with USDA approved spark arrester, may be ordered directly from Murphy Muffler, 5312 East Beverly Blvd., Los Angeles, Ca. 90022.

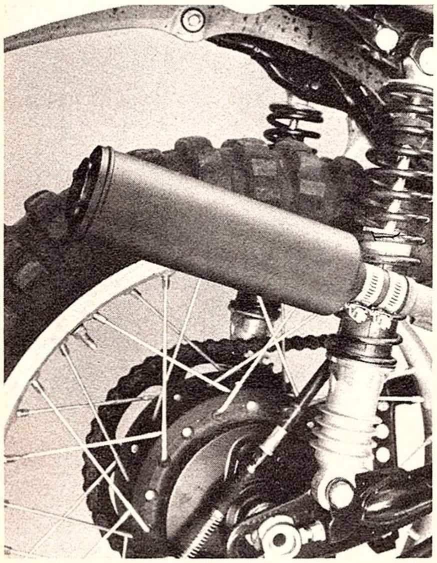
J & R MANUFACTURING CO. J&R was one of the first companies to offer silencers made to order for expansion chamber ends. As it was in the beginning, it remains today: an effective and simple device. A steel cyclinder 2.5-inches in diameter is swaged down to fit over the stinger on one end and left open to receive the core and packing on the other. The core is a perforated steel tube with a locating spring on the closed end and a centering disc on the exhaust end. Fiber glass packing is stuffed between the outside of the core tube and the wall of the container. A big snap-ring holds the assembly together and makes it quickly and simply serviced.

Rebuild kits include fiber glass, a new core, and a new coil spring. For tuning purposes, the cores are available in ID sizes of 15/16, 1, 1-1/8, 1-1/4, 1-3/8, and 1-3/4 inches. The cores each come with a complete rebuild kit and list for $2.00.

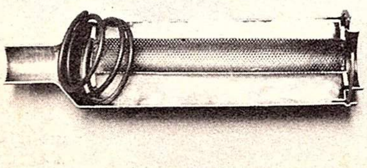
The J&R is mounted on the bike's stinger with a hose clamp. For a secondary mount, we recommend that a large cable clamp and strap be attached to the muffler and frame.

When mounted on the end of the full stinger, the J&R gave dyno readings very close to those of the standard Honda outfit. Shortening the stinger eased out the peak a bit and sustained high rev power significantly better.

Retail price for the J&R model XX-C is $11.95. For a brochure and the name of the closest dealer, send a note to J&R Manufacturing, 7738 Scout St., Bell Gardens, Ca. 90201.



J&R



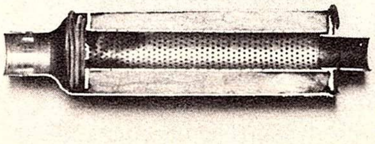
BASSANI MANUFACTURING. Two body sizes are available for two ranges of stinger diameters. The 2-inch OD body is available with neck sizes from ¾-inch to 1⅜ ID and a 2¼ inch diameter body covers the stingers from 1½ to 1¾ inch. Each body comes sized for the stinger diameter of a particular bike.

Design and construction methods are practically identical to those of J&R, with the spring, core, and packing being held in place with a quickly removable snap-ring. The body is fastened to the stinger with a hose clamp, and is light enough so that the clamp is all that is likely to need. A bag of repacking fiber glass costs only $.50.

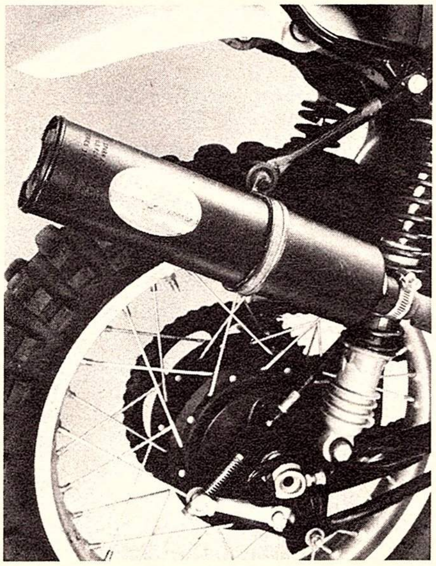
Power-wise, the little Bassani performs brilliantly. Mounted on the end of the stock stinger, it coaxes the engine to pull right along with the standard unit up 7500 rpm, then keeps it from falling off so abruptly during the last 1500 rpm.

The model Q01000 silencer retails for $12.00 and can be ordered from Bassani Manufacturing, 3726 E. Miraloma, Anaheim, Ca. 92806.

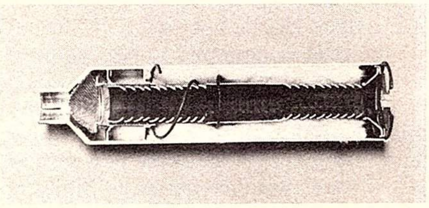
Bassani



SKYWAY MACHINE, INC. Two distinct models are offered by this established firm: the first is the straight-through competition type and the other is a bigger, quieter model with a spark arrestor and a silicon rubber diaphragm in its end plate. For the 1-inch Honda stinger diameter, they are known as the Model 74 Silencer and Model 74ALD Super Silencer/Spark Arrestor respectively. Both models are made with extruded aluminum housings. The straight-through model has

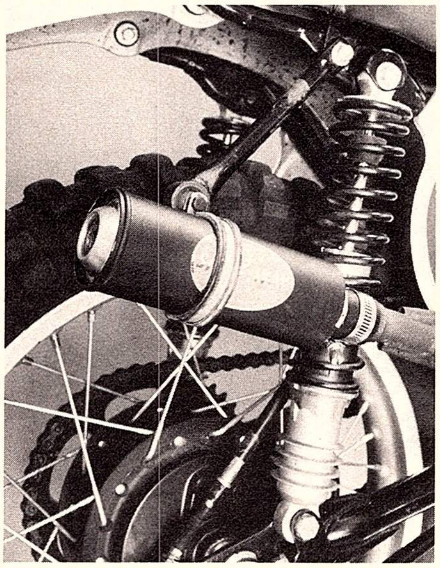


Skyway 74

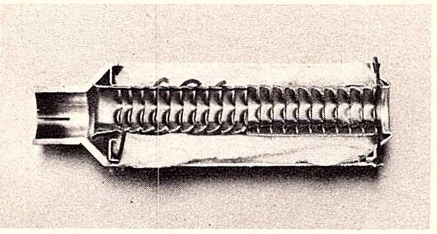


its louvered core tube surrounded by fiber glass, is supported by a load spring on the stinger end, and is secured by a snap-ring on the exhaust end. The core and fiber glass come out of the 2.5-inch diameter housing quickly and easily for rebuilding in a matter of minutes. Enough fiber glass for three repacks costs $1.95.

The mounting necks are slotted for their hose clamps and steel reducing sleeves adapt their 1.125-inch bores to the stinger diameter. The extrusion forming process allows the shell thickness to be increased in the mounting neck and diffusion cone sections for extra strength in these high-heat and vibration-sensitive areas, while the insulated shell can be left relatively thin to reduce weight.



Skyway 74 ALD



The Super Silencer has the designation 74 ALD: A for aluminum, L for long body (13.75-inch overall), and D for diaphragm. Exhaust gases encounter the spark arrestor module immediately upon entering the Super Silencer. The module is composed of six steel pieces furnace-brazed together. Foremost in the gas/module encounter is a cone-shaped screen which deflects a certain portion of the gas, and all of the glowing carbon particles, out through a swirl-disc and into an expansion chamber. In the center of this chamber is a screen tube which lets the carbon-accompanying gas rejoin that which went straight through the cone. The module's outer wall fits snugly against the inside of the aluminum shell. Removing the arrestor module reveals three .75-inch holes in its wall for washing and removing accumulated carbon. A spring welded to the core tube compresses against the module to keep it firmly in place. The core tube has three sections of louvered baffle, the center section being off-set from the end ones to promote turbulence so that the sound waves have maximum exposure to the fiber glass packing. A unique end plate in the Super Silencer forces the gases to open a perforated diaphragm in order to escape. Skyway submits that the diaphragm ensures that sound waves of differing frequency do not resonate, and indeed that it causes some waves to collide and cancel each other's energy! The end plate pushes the assembly against the load spring far enough for the retaining snap ring to be placed in its groove. As with the simpler Model 74, the Super Silencer can be disassembled, cleaned, and put back together in a matter of minutes.

The diaphragm in the original end plate overheated and permanently deformed during dyno testing. A modified plate/diaphragm assembly has been developed by Skyway and will soon be introduced to their Super Silencer production line. We tested the new plate and it did not deform during severe use.

For riders who have previously bought Model 74s for their bikes and later discovered that they need a spark arrestor, Skyway offers a conversion kit. The kit contains a smaller arrestor module, a core and spring assembly, and a length of fiber glass packing. This kit costs $16.95.

A complete rear mounting clamp kit is furnished with the Model 74 ALD and is available for $3.95 for the Model 74. The complete 74 ALD is $32.95 and the Model 74 costs $14.95.

Both Skyway models produced excellent power curves. They did so clearly preferring the shortened stingers; the only units in this test to do so. The short, straight-through racing silencer (Model 74) was the only one to allow the Elsinore engine to top 28 bhp. As with all the racing silencers, this one gave a huge burst of power from 5000 to 6500 rpm. Extraordinarily, the Super Silencer allowed the same sort of burst with only slightly diminished numbers and, as we shall see later, with incredibly less noise. The shortened stinger did spread the power out over a wider rpm range, a setting which would give better control on very slick ground.

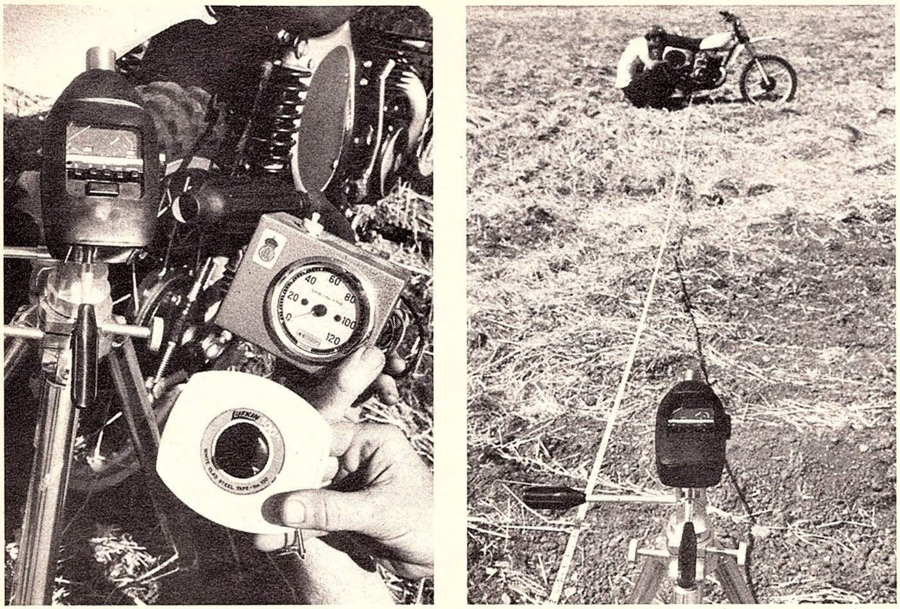
SOUND LEVEL TESTING: This is the biggest can of worms in all of motorcycling. Nearly everyone wants all machines, not just motorcycles, to operate less obtrusively. Because of several peculiarities in human nature, the control of mechanical noise in our lives involves us with the political vagaries of the legislative, judicial, and law enforcement agencies of local, state, and national government. The deluge of double-talk and techno-jargon used to describe the effects and control of sound (or noise, depending on one's point of view) is maddening to those who aren't interested in such abstracts.

Initial laws governing noise control were simple and aimed exclusively at loud cars and bikes. If a cop was hiding behind the signboard when you gassed it up with a loud pipe, you got busted. Then the concept of environment became public and acquired a Federal protection agency. When the financial heavies like truckers and construction equipment people came under fire for making their share of the racket, the fuzz had to be technically specific. Sound measuring equipment had to be electronically filtered so that it approximated the human ear's sensitivity, and noise level measuring standards had to be developed.

When the testing standards for motorcycles were established, they were all designed to govern normal street usage. No provision was made to test dirt bikes in their natural environment. The only time competition machines were under official noise scrutiny was when they were used on public streets and highways. The biggest reason for the lack of an on-dirt standard was the technical impossibility of getting similar tractive conditions from place to place. Even the proposed new test standard for bikes used in National Forests specifies tests made on pavement when at all possible.

For the purposes of this test, the results of three different standards will be shown but only one set will count toward our rating. The first test is that used by the American Motorcycle Association (AMA) to govern the noise level of racing machines at motocross events. With this method the sound level meter is placed 50 feet directly behind the bike and the engine is held at a constant rpm, which varies according to engine size. For our 250cc Honda test bike, the specified rpm is 5000, plus or minus 200. A VDO electric tachometer was used to keep the Honda as close to a constant 5000 rpm as possible. As you can see from the results, this test gives no correlation with maximum noise and it is published only to illustrate the differences in standards. It is interesting to note that the open, completely unmuffled expansion chamber passed the AMA's 92 dB(A) maximum.

The second illustrative test is one proposed by the California Highway Patrol to be used in policing their Exhaust System Manufacturer's Certification Program. This program would put the responsibility of performance for a certified system completely on the manufacturer. Teams of CHP technicians now set up road blocks at random locations and execute safety equipment and exhaust emission checks. If the proposed standard passes the state legislature, the muffler systems for newer cars would be checked to make sure they had a certification stamp on them, and older vehicles would be checked for actual noise level. The



Sound level meter, tape measure, and electric tachometer were equipment used to turn sound into numbers for all tests. The AMA racing method and the California Highway Patrol proposed certification method gave results too variable to use. So CYCLE's own dirt-racer-maximum-noise standard was the one which counted for the ratings shown in the results.

testing standard calls for the noise level meter to be held one foot away from the end of the pipe at ninety degrees, plus or minus forty-five degrees, to the direction of exhaust flow. For motorcycles, the reading is taken while "the throttle is rapidly opened to its fullest extent and then immediately closed." It is difficult to figure what the CHP really means by this, for some bikes will cough and die if their throttle is opened as quickly as some people can open it. The CHP test results show the minimums we were able to get by snapping the throttle open and closed as fast as possible and the maximum attainable readings obtained by letting the revs reach maximum before closing the throttle. Besides being susceptible to the effects of differences in operator experience in throttle control, the test is vastly biased against quick-responding multi-cylinder bikes. As with the AMA test we were able to get the completely unsilenced expansion chamber to pass the CHP test at 112 dB(A).

Our comparative test utilizes a slight variation of the proposed National Forest test. The sound level meter is placed 50 feet from, and perpendicular to, the Honda's path of travel. Then the bike is ridden along the path at a constant 4000 rpm in second gear until its front wheel reaches a point 25 feet from the meter line. The throttle is then opened and the sound reading is taken until the bike is 25 feet past the meter line. The surface is a freshly plowed field which is level and unobstructed for several hundred yards around the test area. There was quite a bit of wheelspin but enough traction was afforded to keep the front wheel slightly elevated for most of the acceleration run. While it is not a test that could be duplicated in many different locations, the results were as repeatable for our purposes as those we run on pavement. And, by doing it in the dirt, we got readings much more near those which could be expected at any motocross or enduro event. The readings expressed are the averages of three runs in each direction.

Our equipment is a 1565-B General Radio Sound Level Meter (fitted with their 1560/9521 urethane foam windscreen) and a 1562-B Sound Level Calibrator made by the same company. The meter was calibrated before and after each series of readings was taken.

One of the more disturbing regulations in the noise measurement standards for both the Society of Automotive Engineers and the CHP is their allowance of up to 12 mph wind gusts during testing. The SAE suggests that 3 dB(A) allowances be made for temperature, humidity, and wind; the CHP standards do not mention atmospheric condition allowances, except that no readings varying than 2dB(A) may be part of the reported average. We observed variations over 5 dB(A) with the wind gusting under 12 mph. During our

NOISE LEVEL IN dB(A)

Brand	AMA Std.	Proposed CHP Cert. Std. Min/Max	CYCLE Dirt Std.
Fun N' Fast	76–79	104/123	90.3
Xdusor II	73–76	102/119.5	87.4
with reed	73–75	99/117	85
Xdusor S	74–76	101/117	85.5
with reed	73–75	101/117	82.75
Trapp Comp.	76–78	101/119.5	86.9
Trapp Std.	74–76	102/118.5	85.4
Murphy	80–83	104/119	88.75
J&R	75–77	108/125	92
Bassani	77–79	112/117	92
Skyway Mod. 74	78–82	113/125.5	89.9
Mod. 74 ALD	72–74	98/117	76.3
Honda Std.	76–79	102/121	88.5
Honda open	88–92	112/131	101.5

Silencer Dyno Charts:

A careful study
of these real figures
compared to your
race track diagrams
and the sound figures
will decide which system
is best for your bike.

1 Std. Silencer

RPM	HP	Torque
3500	6.88	10.32
4000	8.27	10.86
4500	9.89	11.54
5000	14.07	14.78
5500	19.73	18.84
6000	24.24	21.21
6500	27.69	22.37
7000	26.63	19.98
7500	26.17	18.32
8000	25.83	16.95
8500	17.07	10.55

2 No Silencer

RPM	HP	Torque
3500	6.95	10.43
4000	8.27	10.86
4500	9.85	11.50
5000	14.03	14.74
5500	19.62	18.74
6000	24.14	21.13
6500	27.37	22.12
7000	26.40	19.81
7500	26.41	18.49
8000	25.70	16.87
8500	17.59	10.87

3 Std. Silencer

4½" Stinger Removed

RPM	HP	Torque
3500	6.70	10.05
4000	8.15	10.70
4500	9.86	11.51
5000	13.24	13.91
5500	19.71	18.83
6000	23.84	20.87
6500	27.03	21.84
7000	24.82	18.62
7500	25.74	18.03
8000	24.45	16.05
8500	16.49	10.19

4 Fun 'N Fast

1″ Silencer
Full Stinger

RPM	HP	Torque
3500	6.90	10.35
4000	8.46	11.11
4500	9.88	11.53
5000	13.30	13.97
5500	19.45	18.58
6000	24.06	21.06
6500	27.37	22.12
7000	26.19	19.65
7500	26.24	18.38
8000	26.03	17.09
8500	19.54	12.07

5 Fun 'N Fast

1″ Silencer
4½″ Stinger Removed

RPM	HP	Torque
3500	6.42	9.63
4000	8.42	11.05
4500	9.87	11.52
5000	13.05	13.71
5500	19.69	18.80
6000	23.98	20.99
6500	27.37	22.12
7000	25.18	18.89
7500	25.77	18.04
8000	26.11	17.14
8500	20.98	12.96

6 Xdusor II

Std. Without Reed
Full Stinger

RPM	HP	Torque
3500	6.71	10.06
4000	8.16	10.71
4500	9.72	11.35
5000	13.46	14.14
5500	19.87	18.97
6000	24.77	21.68
6500	27.53	22.24
7000	26.70	20.03
7500	26.01	18.22
8000	27.08	17.78
8500	19.07	11.78

7 Xdusor II

Without Reed
4½″ Stinger Removed

RPM	HP	Torque
3500	6.45	9.68
4000	7.79	10.22
4500	9.77	11.40
5000	12.71	13.35
5500	18.93	18.07
6000	23.31	20.41
6500	26.65	21.53
7000	24.39	18.30
7500	25.21	17.66
8000	26.10	17.13
8500	19.86	12.27

8 Xdusor II

With Reed
Full Stinger

RPM	HP	Torque
3500	6.30	9.45
4000	7.50	9.84
4500	9.16	10.70
5000	11.17	11.73
5500	16.58	15.83
6000	20.93	18.32
6500	24.38	19.70
7000	23.90	17.93
7500	22.93	16.06
8000	24.45	16.05
8500	25.29	15.63

9 Xdusor II

With Reed
4½″ Stinger Removed

RPM	HP	Torque
3500	6.11	9.16
4000	7.54	9.90
4500	9.14	10.67
5000	11.07	11.62
5500	17.17	16.39
6000	21.15	18.51
6500	25.32	20.46
7000	22.66	17.00
7500	22.20	15.55
8000	24.26	15.93
8500	25.72	15.89
9000	11.80	6.89

10 Xdusor-S

With Reed
Full Stinger

RPM	HP	Torque
3500	6.30	9.45
4000	7.49	9.84
4500	8.65	10.10
5000	11.61	12.20
5500	17.47	16.69
6000	22.05	19.30
6500	24.91	20.13
7000	24.47	18.36
7500	23.24	16.27
8000	25.10	16.48
8500	25.47	15.73
9000	14.67	8.56

11 Xdusor-S

With Reed
4½″ Stinger Removed

RPM	HP	Torque
3500	6.04	9.06
4000	7.36	9.66
4500	9.01	10.52
5000	11.09	11.64
5500	17.32	16.54
6000	21.11	18.47
6500	25.27	20.42
7000	22.62	16.97
7500	21.48	15.04
8000	24.38	16.01
8500	25.46	15.73
9000	14.54	8.49

12 Xdusor-S

Without Reed
Full Stinger

RPM	HP	Torque
3500	6.84	10.27
4000	8.15	10.70
4500	9.71	11.34
5000	13.24	13.91
5500	19.04	18.18
6000	23.86	20.89
6500	26.82	21.67
7000	26.30	19.73
7500	25.68	17.98
8000	25.95	17.04
8500	15.59	9.63

13 Xdusor S

Without Reed
4½″ Stinger Removed

RPM	HP	Torque
3500	6.67	10.00
4000	8.23	10.81
4500	9.81	11.45
5000	13.01	13.67
5500	19.60	18.72
6000	23.61	20.66
6500	27.18	21.96
7000	24.53	18.40
7500	25.21	17.66
8000	25.57	16.79
8500	20.56	12.70

14 Trapp Comp.

TC-1000
Full Stinger

RPM	HP	Torque
3500	6.93	10.41
4000	8.43	11.06
4500	10.03	11.71
5000	14.32	15.04
5500	20.15	19.24
6000	24.74	21.66
6500	27.66	22.35
7000	26.11	19.59
7500	25.53	17.88
8000	23.63	15.51
8500	17.04	10.53

15 Trapp Comp.

TC-100
4½″ Stinger Removed

RPM	HP	Torque
3500	6.15	9.23
4000	7.94	10.42
4500	9.75	11.38
5000	13.09	13.75
5500	19.79	18.90
6000	23.17	20.28
6500	27.13	21.92
7000	24.40	18.31
7500	25.17	17.62
8000	24.87	16.33
8500	21.22	13.11

16 Trapp Std.

Full Stinger

RPM	HP	Torque
3500	6.56	9.88
4000	7.99	10.49
4500	9.53	11.12
5000	12.88	13.53
5500	18.82	17.97
6000	23.42	20.50
6500	26.63	21.52
7000	25.95	19.48
7500	25.93	18.15
8000	27.71	18.19
8500	14.90	9.20

17 Trapp Std.

4½″ Stinger Removed

RPM	HP	Torque
3500	6.16	9.24
4000	7.91	10.39
4500	9.76	11.39
5000	12.59	13.22
5500	19.13	18.27
6000	23.14	20.26
6500	26.89	21.73
7000	25.22	18.92
7500	25.07	17.55
8000	26.53	17.42
8500	21.24	13.12

18 Murphy

Full Stinger

RPM	HP	Torque
3500	6.12	9.18
4000	7.40	9.72
4500	8.96	10.46
5000	12.24	12.85
5500	18.33	17.51
6000	22.84	20.00
6500	26.18	21.15
7000	25.62	19.22
7500	25.26	17.69
8000	26.42	17.34
8500	19.54	12.07

19 Murphy

4½″ Stinger Removed

RPM	HP	Torque
3500	5.87	8.80
4000	7.53	9.88
4500	9.38	10.95
5000	12.07	12.68
5500	18.66	17.82
6000	22.77	19.94
6500	26.86	21.71
7000	25.20	18.90
7500	25.04	17.54
8000	26.18	17.19
8500	21.22	13.11

20 J & R

Full Stinger

RPM	HP	Torque
3500	6.80	10.21
4000	8.01	10.52
4500	9.83	11.48
5000	13.89	14.60
5500	19.82	18.92
6000	24.37	21.33
6500	27.64	22.33
7000	26.46	19.85
7500	26.23	18.46
8000	26.16	17.17
8500	17.03	10.52

21 J & R

4½″ Stinger Removed

RPM	HP	Torque
3500	6.78	10.17
4000	8.16	10.71
4500	10.31	12.03
5000	13.05	13.71
5500	19.78	18.89
6000	24.13	21.12
6500	27.42	22.16
7000	25.35	19.02
7500	26.01	18.22
8000	26.11	17.14
8500	20.46	12.64

22 Bassani

Full Stinger

RPM	HP	Torque
3500	6.82	10.24
4000	8.39	11.01
4500	9.80	11.43
5000	13.04	13.70
5500	21.35	18.13
6000	23.89	20.91
6500	27.80	22.46
7000	26.57	19.93
7500	26.16	18.32
8000	27.31	17.93
8500	20.04	12.38

23 Bassani

4½″ Stinger Removed

RPM	HP	Torque
3500	6.45	9.68
4000	7.83	10.28
4500	9.76	11.39
5000	12.69	13.32
5500	19.40	18.52
6000	23.69	20.74
6500	27.42	22.16
7000	25.41	19.07
7500	25.64	17.96
8000	27.08	17.78
8500	20.81	12.86

24 Skyway 74

Full Stinger

RPM	HP	Torque
3500	6.61	9.92
4000	8.27	10.86
4500	10.03	11.71
5000	12.89	14.61
5500	19.66	18.78
6000	24.09	21.09
6500	27.53	22.25
7000	26.46	19.85
7500	26.32	19.85
8000	25.96	17.04
8500	17.03	10.52

25 Skyway 74

4½″ Stinger Removed

RPM	HP	Torque
3500	6.71	10.08
4000	7.97	10.47
4500	9.99	11.66
5000	13.63	14.31
5500	20.35	19.43
6000	24.89	21.79
6500	28.17	22.76
7000	25.62	19.22
7500	25.88	18.12
8000	26.03	17.89
8500	21.44	13.25

26 Skyway 74ALD

(300 Series)
Full Stinger

RPM	HP	Torque
3500	6.61	9.93
4000	7.48	9.82
4500	9.55	11.14
5000	13.12	13.78
5500	18.25	17.42
6000	21.96	19.22
6500	25.39	20.51
7000	26.08	19.57
7500	24.26	16.99
8000	26.19	17.20
8500	23.17	14.32
9000	13.54	7.90

27 Skyway 74 ALD

(300 Series)
4½″ Stinger Removed

RPM	HP	Torque
3500	6.55	9.83
4000	7.82	10.26
4500	9.74	11.37
5000	13.54	14.22
5500	20.03	19.13
6000	24.38	21.34
6500	27.53	22.25
7000	25.02	18.77
7500	25.60	17.92
8000	24.75	16.25
8500	19.38	11.98

normal monthly sound level testing, we can wait for any occasional gusts to die before taking any readings, but it was impossible to take all the readings for this test in absolute calm. Some of the numbers on the comparison chart may be biased as much as 2 dB(A).

USING THE RESULTS: It is obvious that none of the silencer tips can be all things to all riders. If a machine is to be silenced as much as possible while still retaining really good performance and the bike is going to be ridden where regulation and/or conscience require a spark arrestor, then the Skyway ALD is the best choice if cost and vulnerability are not prime considerations. The other spark arrestor models, the Murphy and the flat-sided Xdusors, are less likely to get wiped out in the inevitable spills, but they allow more noise—and the Xdusor is difficult to repack properly. And the Murphy is made of cast aluminum pieces which can break apart instead of bending when the silencer is caught between a rock and a hard place.

If real out-and-out racing is your only concern, then any of the silencers is legal according to present regulations. The question in racing should be answered by the model which allows you to have the best compromise in terms of lap times and tactical advantage. When rider abilities are roughly equal, the guy who is sharpest at setting his gear ratio and power curve to suit the course will have the advantage. The real pros will draw a pencil sketch of how the course looks at speed. Then, in practice sessions, they will concentrate on one or two corners at a time until the whole map is covered with notes like: "engine lugging," "too rough for proper throttle control," "excessive wheelspin," and "needs to pull ten feet farther without running out of power, but corner too close to shift." If, for example, the big burst of power as produced by the Skyway 74 did nothing on a particular course except cause wheelspin and handling difficulty, then the Xdusor with a reed installed might give better times or allow a rider to get to a tight section first. By careful cross-referencing of stop watch times and course anatomy, you will gain the ability to quickly make accurate judgements with a minimum of self deception.

Please remember that the power curves in this article are only valid for a standard Honda 250 Elsinore. You may reasonably expect that the silencers will have similar effects on other 250cc motocrossers whose engines are tuned to deliver similar power curves. The differences will be less on smaller motocrossers and greater on larger ones. We don't know yet what the effects will be on mildly tuned enduro and trail bikes, but they usually have fairly effective silencers to begin with. It is our hope that the data in this article will help you to decide which silencer will best suit your needs in modifying the exhaust system of a motocross-type engine. ⊙

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1060
BEWARE OF DOG
KAWASAKI
KAWASAKI
1. GO BACK & CLEAN YOUR ROOM
2. RAKE UP LEAVES.
3. MOW THE LAWN.
NOW!
LOVE MOM
P.S. BE HOME FOR SUPPER

CIRCLE NO. 35 ON READER SERVICE PAGE.

THE WAY I SEE IT, 16 is a freaky age. When you turn 16, you're turning a corner in your life, heading right down the road to what they call 'adulthood'.

I mean, now you can handle responsibility better than before, and you like the feeling. But there's a catch…Catch-16. Once people know you're more responsible, they give you more responsibilities. You just can't go out and enjoy yourself anytime you want. Those days are over. Now you earn your good times.

But if you're into motorcycles, like I am, it's worth it, for sure. Because here's the good part of Catch-16 – the sooner people know you're responsible, the sooner you'll own a bike. That's what I found out when I decided I wanted a Kawasaki, the F-11 250.

Before my dad would talk about it, I had to get together all the facts and my friends' opinions and show him the specs and explain why the F-11 was the bike for me. Like it was simple to ride and very rugged and had a good reputation, and I could ride it to school or on trails. Then we agreed I'd help pay for it.

Now I'm so responsible I can hardly stand it, but I have more good times than ever. So when you're 16, you take your good with your bad. And maybe that's how it is the rest of your life. I don't know. I know one thing – when I'm 21, I'm moving into an apartment with maid service.

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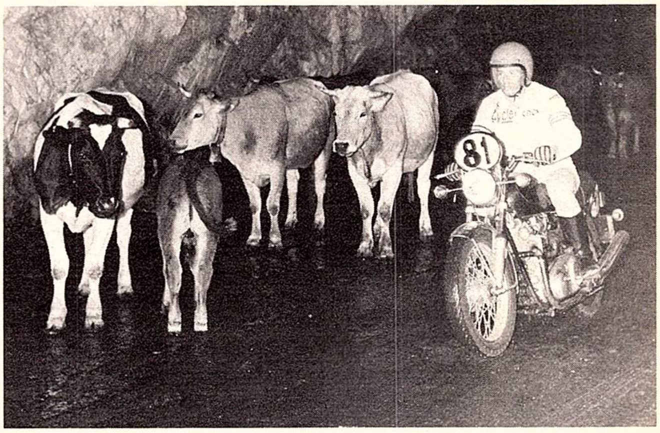
11

• The narrow road that swirls like smoke up the flank of the Col de Lizarietta is diseased with tar slicks, gravel patches, blind entries, off-cambers, hairpins and scratchy, pale scars where the road has pounded motorcycles to the ground and shrugged them, engines howling, deep into the underbrush. As Keith Blair lashed the complaining rental car through an epidemic of bumps and twists and Bill Colquhoun watched silently from the passenger seat, I was in the back gathering wisps of nausea. The car swayed around a thousand bends, the right-handers edged by tree-trunks and damp embankments and the lefts by unguarded straight-down-the-mountain terminal plunges.

The Lizarietta was one of two scheduled speed tests—hill-climbs—included in the Circuit des Pyrenees Rally. We had explored the Col du Soloir section on our bikes, and while it was demanding and deadly dangerous we found that we were up to it. The Bois de Bager hillclimb was tricky but it too could be handled. The 321-mile, 16-checkpoint Pyrenees route presented no insurmountable problems. But the Lizarietta was so redolent of consequence and so consumed with treachery that the mere sight of it brought out my white flag. I could get up it, all right. Anybody could get up it. But to avoid penalty the 5 kilometer Lizarietta climb had to be covered in precisely 4 minutes and 20 seconds. In the 22 years of the Pyrenees rally few have done the Lizarietta in standard time. I would try, I decided, to hustle through the Bois de Bager, hustle through the Col du Souloir and make every attempt to zero the route checks. But the Lizarietta? It had me dead to rights before I even twisted a throttle in anger. If I don't hang it out, I decided, it wouldn't get cut off. And the Col de Lizarietta brandished swords with every corner.

If you miss the cows in the tunnels, the potholes in the pavement, the gravel in the corners and the shade-covered wet spots, you get to finish. If you run into the side of a barn with 300 miles to go and your name is Heinz Finn, you get to finish too.

PHOTOGRAPHY: NICK SKINNER



BEYOND RACER ROAD: CIRCUIT DES PYRENEES

By Cook Neilson

The Circuit des Pyrenees is the ultimate remaining Racer Road experience. Held this year for the 23rd time, it is organized by the Union Motocycliste Paloise and owes its existence to the efforts of Jeanette and Roland Roussel, for whom the rally is a labor of love and a debilitating consumer of time. It works much like an American enduro, except for the special speed sections, the constancy of the required average and the substitution of asphalt for trail. European law dictates the speed: 60 kilometers per hour, or 37 mph. The event takes place in June. Mike Jackson, formerly General Manager of Norton-Villiers' distributorship in California, had participated in the rally in 1973. He found it refreshing and a great challenge, and invited me along for the 1974 version. I accepted and it began raining details. FIM license; insurance; entry forms; passport; transportation from California to England to France. Judy Wampler of the AMA's licensing department took care of the FIM, I bought the tickets and Norton-Triumph handled the rest.

When Bill Colquhoun and I got off the plane in Pau we were surrounded by the fragrant glow of a south France afternoon, and the warm affection of a south England Neale Shilton. Shilton is over 60. He handles Norton-Triumph's contract sales, and had discovered the Pyrenees rally in 1971 when he was invited by his friends in the British motorcycle police to participate. He took them up on it and has not missed one since. Colquhoun and Jackson came along in 1973 at Shilton's urging.

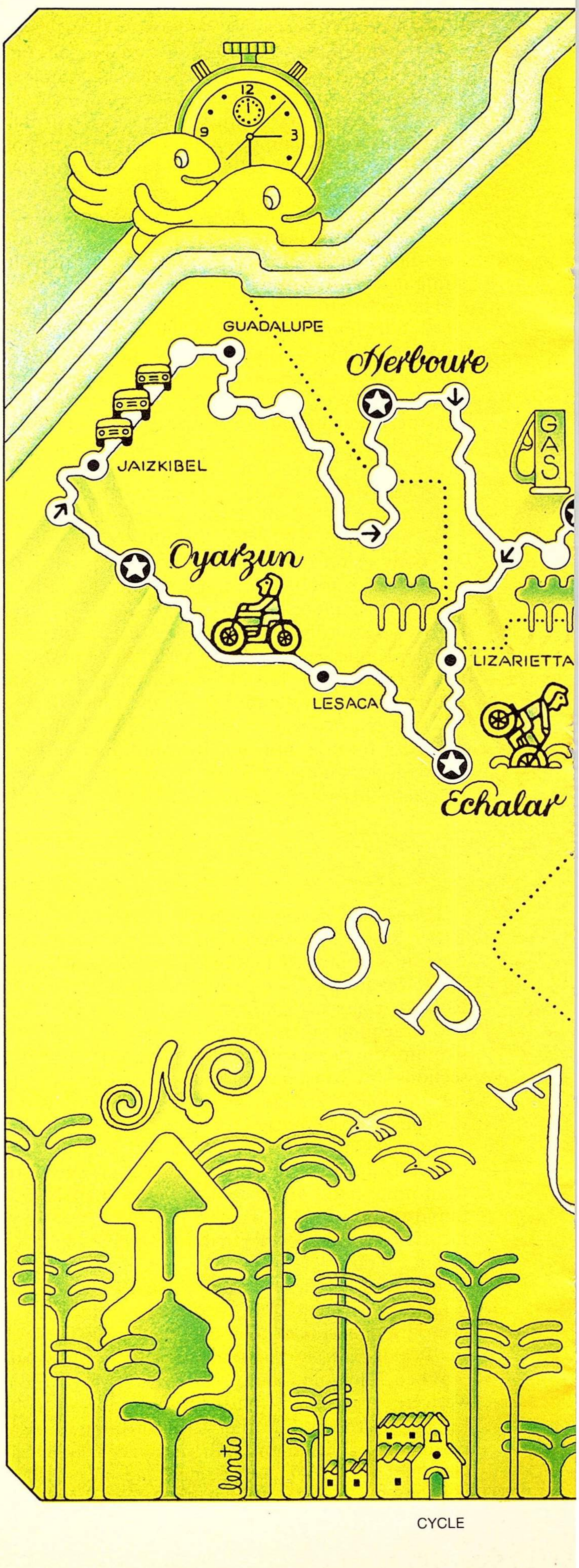
Shilton's urging can be a persuasive thing; the man himself is totally impressive. Among other things he is a prodigious and lyrical raconteur, a superb motorcycle rider, a beguiling companion and a quick-draw quipster (what to call the new Norton-Triumph? "The Striker, I shouldn't wonder," muttered Shilton.) At 63 he still has the look of eagles and the manner of a man who was once a rapscallion and hasn't forgotten how.

Neale met us at the Pau airport. He had a fresh wound on his nose. "Tipped over practicing on the Aubisque," he said, and hopped on his Interpol to lead us to our hotel. The 850 Nortons we were going to ride were parked in a shed in back, number-plated, clean and ready. I was consumed with curiosity about the event. How hard do you have to go? As hard as you can in some places, not so hard in others. Is it easy to get lost? On some parts of the course, yes, except for the children along the way, who help. How? By pointing the right direction. Are there route markers? Yes, but some of them will be stolen before Sunday as souvenirs. How about refuelling? We think we can arrange for the British police to help. Is it likely to be wet? As likely as it is to be dry. What to look for? Melted tar, gravel, a part of the course that is unpaved, moss growing on the Bois du Bager hillclimb, donkeys and cows in one of the tunnels, the downhill after the Lizarietta and before Echalar, and everything else you can think of. How fast are the other guys? Fast. How fast? Real fast. What happens if you exceed the speed limit? Nothing unless you run into a secret check. Then, if you're going 55 mph or better, you get docked 300 points. How many points do you lose for being late or early to a checkpoint? Sixty per minute. How about the hillclimbs? Two per second.

But what's it *like?* You'll see.

The next morning—Friday, two days before the event—Neale Shilton, Bill Colquhoun, Keith Blair and I fired up our Nortons and headed out of town towards Ferrieres (the first checkpoint) and the Col du Souloir for some practice. Blair runs Norton's Paris sales office and is among the most accomplished street gunners I have ever ridden with. The Ferrieres section was easy—straight, benign, perfectly paved. "Remember," cautioned Blair, "you want to make sure you don't go too fast here. You're in just as much trouble early as late, and the average speed is only 37 mph. Last year some members of the French Gendarmerie were penalty-free until they got caught going too fast. Cost them 300 points and dropped them right out of it."

After that, the small town of Arbeost and the climb up the Col du Souloir. It was murderous. Bright sunlight cast strong shadows which obscured wet spots and patches of loose gravel. The Nortons' torque made second gear the most comfortable; but its widely-spaced four-speed transmission likewise made first difficult to use, and the side-stand stole ground clearance. Finally the abrupt and shady hairpins were transformed into corners of more charitable radius, and the trees dropped away beneath us. Gasping behind Blair, we pulled into Monsieur Poulo's



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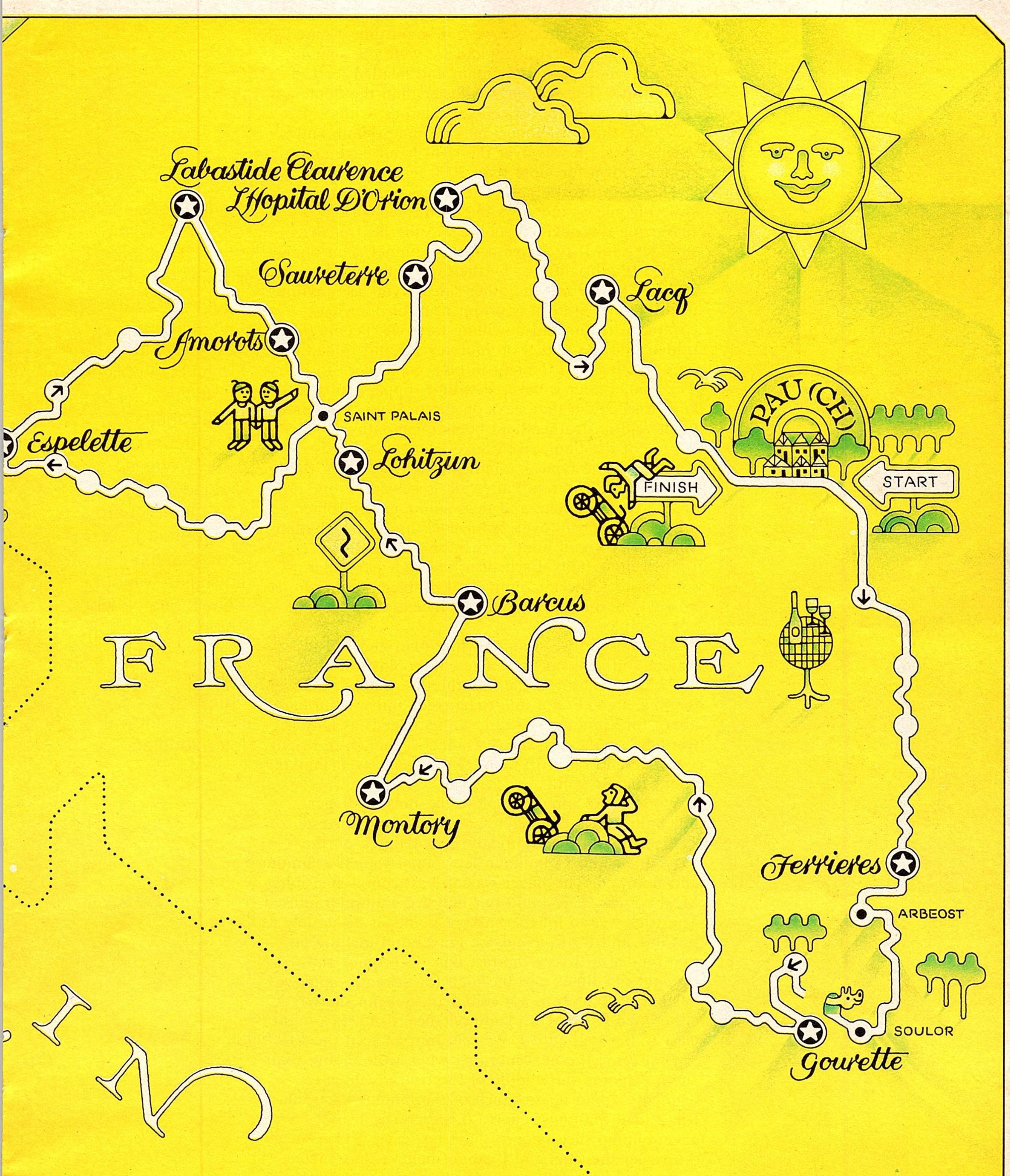

café/hardware/sporting goods/tourist trap/bistro and checked our watches: we were in good time. Some café au lait laced with strategy and we were off, singing along the side of the mountain and headed for Col d'Aubisque. The section was faster than the Souloir climb had been and twice as dangerous. Cliffs overhung the left-handers making them blind, and if you blew one it was over the right-hand edge and straight down for more than 2000 feet.

There are two tunnels. The first one is short and sweet. Donkeys and cows live in the second one, preferring its convivial coolness to the heat of the summer sun. It is very much their tunnel. You plunge in from the brightness; by the time your eyes have adjusted you're out the other side. If you see anything in the tunnel at all it is propped up on four legs, covered with fur and unwilling to move. People have ridden into the tunnel on motorcycles and ridden out on cows. It is not thought to be a good place to hurry. The tunnel floor is covered with a slippery substance known as cowsh that stays on the tires for a hundred yards and on leathers and boots for months.

Free of the tunnel we donkey-dodged towards Aubisque. The typical American highway has a rhythm that repeats. The road, after all, is hewed by one man or one team of men, and their solutions to problems are used over and over again. Pick up on the rhythm and you can read blind corners. Not true in the French mountains. Each turn reflects a particular solution to a specific, individual problem, and there is no rhythm. So you have to eye-race and be lucky if you gamble.

At Aubisque we stopped while Blair checked his watch: still in good time. The checkpoint would be a few kilometers down the hill, the descending road was looping, smooth and mildly banked, and we still had about four minutes. It could be managed—as long as we didn't make a mistake. Managed, that is, in bright sunshine and on a dry road. We weren't even thinking about fog, or rain.

We still had time to explore the Bois du Bager hillclimb, a five-kilometer snake just beyond Izeste. The starting line had already been painted on the road. Blair and Colquhoun left first; I waited a minute and followed. The Bager was at least comprehensible. Most corners were blind but they were amply radiused. The trick was to hit the braking points as accurately as possible and try to avoid the gravel and melting tar that tended to wreck the fast line. Two quick runs brought our times into the high four-twenties and we headed back to Pau, not confident, but not shattered either. We felt that we had a chance, if not to win, at least to be competitive. We had not yet seen the Lizarietta.

That came the next morning when Colquhoun, Blair and I explored the middle of the course's three segments. I had heard much of the famous Lizarietta. I had read Shilton's report ("Lizarietta is a never-ending succession of hairpins, each with a sheer drop over the side, and I cannot believe that anyone could get to the top in set standard time. Opinions vary as to whether the machine is upright three times or four, but I settle for once at the start and once at the finish line. The fastest man in 1973 was the outright winner of the event, Jean Pierre Geneletti,

Chris Spense (left, top) deals with his second flat tire. His fourth retired him. Peter Graveson (left, middle), a hard-riding Lancashire policeman, negotiates one of the Lizarietta's wickeder curves. The Pyrenees Rally's first lady rider, Christine Richard (left, bottom), arrives at the finish line without benefit of a clutch cable. To the right, Pyrenees Patriarch and yarn-spinner supreme Neale Shilton, Interplodding.

(*Continued on page 90*)

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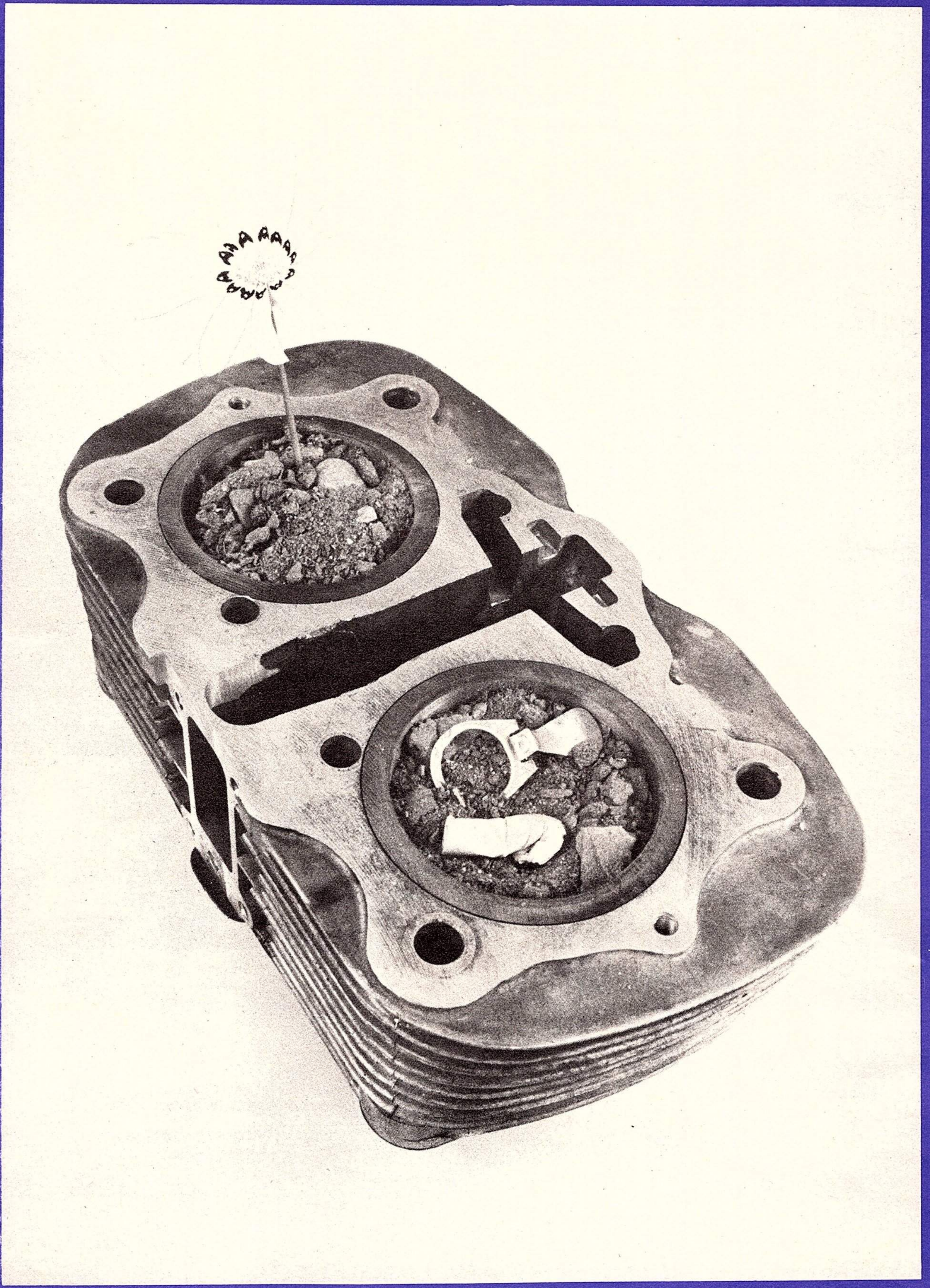


PHOTOGRAPHY: DALE BOLLER

Basics

FILTERS

AIR • OIL FUEL

By Gordon Jennings

• About half the café racer motorcycles we see are being operated without intake filters, inhaling their air through bare carburetor velocity stacks. It's a fashion born of misguided sporting instincts and we consider it to be devastatingly imprudent. Air may be pretty thin at ambient pressures, but it has enough body to carry an amazing number of floating dust particles, and this dust is nothing less than poison for motorcycle engines.

Tests have shown that something like 30 grams of fine grit added to the intake air will bring about the near-complete destruction of a smallish engine. With that in mind it is frightening to contemplate a motorcycle's appetite for air: on average a bike's engine will pump ten thousand gallons of air through its cylinders in burning a single gallon of gasoline, and upwards of *two million* gallons will be pulled out of the atmosphere in a year of riding. Disperse 30 grams of grit in that much air and it won't even look dusty.

It should be understood that only a small fraction of that 30-gram fatal dose is captured inside an engine; most of the airborn grit aspirated into a four-stroke engine's cylinders will simply swirl around and be expelled out the exhaust without having had any effect at all. An engine will retain only those particles that come into contact with and are captured by an oiled surface—which in the four-stroke means the cylinderwalls.

Crankcase-scavenged two-stroke engines tend to collect incoming dust particles below their pistons. The fast-spinning crankshaft churns the air/fuel mixture into rapid rotation and centrifugal force then literally hurls the relatively heavy grit outward into contact with the oil-coated interior crankcase walls. The effectiveness of this centrifuging process may be judged by the fact that it is strong enough to also extract the tetraethyl lead from gasoline, which explains why two-stroke engines do not seem to benefit from the anti-knock properties of heavily leaded premium fuels. You can put high-test in the gas tank, but it's regular by the time it reaches the combustion chamber.

Particles of grit trapped on an engine's oiled interior surfaces migrate a lot after their capture. Those in a four-stroke engine are caught on a cylinder-wall, work their way down past the piston rings—causing wear and being worn themselves—to arrive, somewhat reduced in size, in the oil sump. Unless taken out of circulation, by filtration or accidental entrapment as part of the general crankcase sludge buildup, the grit will make repeated trips to all the engine's lubricated surfaces (including return engagements with the piston and rings). Ultimately individual particles will either be scrubbed down to such small size as to be rendered harmless or removed with the oil when it is drained and replaced.

Two-stroke engines are likely, for the reasons already outlined, to catch most dust particles in their crankcases. Some of the incoming grit will travel up into the cylinder before getting stuck and a lot of it probably does the whole trip and disappears out the exhaust port without touching anything. But much of the dust will be centrifuged out of the air in the crankcase, mixing with the oil on the surrounding walls. This oil is not merely a stagnant layer; fresh oil is constantly being added, deposited through the evaporation of a fuel/oil blend or by direct injection as in Yamaha's "Autolube" system. While the pattern of oil movement inside a two-stroke engine is very complex, it may be described as a general migration from the crankcase up through the transfer ports, then across the piston crown and out the exhaust port. Here again, much of the grit will get through the engine without doing any damage, simply flowing along with the oil and departing in orderly, innocuous fashion. Unfortunately some of this oil gets diverted into the crank's mainbearings, some of it will smear out over the cylinderwalls, and some of the grit goes along for the ride.

Dust ingested with intake air can cause damage at a number of points throughout any motorcycle's engine, whether it be two-stroke or four. But the worst gnawings are suffered by the piston rings, and especially by the heavily-loaded upper compression ring. Microphotographs of the working faces of rings removed from dust-frazzled engines show grooves that very closely match the size and shape of dust particles added to the engines' intake air, and these grooves are evident even when no significant scoring of the piston thrust faces may be detected. The use of radioactive tracers has made it possible for researchers to very accurately measure ring wear rates, and it has been discovered that at any given engine load the rate at which rings are worn away is very nearly a pure function of intake air dust content. Feed an engine perfectly clean air and its rings wear hardly at all; add as little as 0.25-gram of fine grit per 7500 gallons of intake air and ring wear will be 50 times faster than normal.

One would expect piston ring damage to become worse with increases in the size of individual dust particles, but such is not the case. Big chunks can cause problems, such as the pitting of valve seats, but the dust particles responsible for most engine wear are mere specks measuring less than .004-inch in diameter, and it has been established that the worst ring wear results when the particles are down in the 20 micron range (1 micron = .000039-inch). Particles only 10 microns in diameter are somewhat less lethal to an engine's rings, but worse than those having twice the worst-size diameter of 20 microns. There is a drastic falling-off in damage potential as particle size is diminished below 5 microns, and one-micron dust appears to do an engine no injury at all—probably because good-quality oil very strongly resists being squeezed into a film thinner than a micron in depth.

It is fortunate that about 70-percent of the particles that constitute ordinary road dust are rather soft silicates, which get crushed in their encounter with the rings and become too small (5 microns or less in diameter) to do further damage. But the same dust will include aluminum oxides, which are very hard, and these can do enormous damage to all of an engine's wear points if allowed to collect in the oil supply. Actually, one good dose of hard particles can establish a pattern of abnormal wear that will persist despite repeated oil changes and the subsequent fitting of an effective air cleaner on the engine. What happens is that the hard stuff becomes imbedded in all the soft bearing surfaces, like tiny teeth, and remain there to slice away at the shafts supported by the bearings.

All the information provided up to this juncture has been intended to persuade the reader, however obtuse he may be, that filtration is absolutely essential in preserving an engine's health. It is true that road racing engines seldom are fitted with air filters, but the stresses imposed upon them are so high they are apt to fracture long before they can become frayed. Thus their working parts usually will be replaced before airborn grit has had a chance to do its insidious harm. Even so, all experienced road racing tuners must have moments, looking at scratched rings, scored cylinderwalls and pitted valve seats, of wondering if maybe they shouldn't buy the protection a good air filter provides.

Let us suppose that you are a tuner, not necessarily concerned with road racing to the exclusion of everything else, and you decide that all your equipment should have air filters. The first question that should come to mind is, what kind of air filters? You could simply follow current fashion and use one of the several available polyurethane foam filters, or the accordion-pleated gauze type made by companies like K&N. But if you investigated the whole matter of air filtration you'd find it extremely complex, with a number of factors to ponder and requirements to be satisfied—and eventually arrive at the conclusion that no single type of filter is a complete answer.

Fundamentally, there are three kinds of filters suitable for motorcycles: the sieve, those relying on impingement, and the centrifugal separator. Each of these has strengths and weaknesses, and their suitability for a specific motorcycle is very much a function of the conditions under which the bike is to be operated.

Paper-element air filters are pure sieves. Their individual fibers are about 20-50 microns apart, but because the filter material has depth, constituting what amounts to a great number of sieves overlaid one above the other, it can trap particles down to an infinitesimal 1 micron in size. Other sieve-type filters exist, those made of hard, molded felt being an example, but most are literally a paper made of fine wood fibers flameproofed with phosphates and given strength by impregnation with a phenolic resin.

There is nothing quite so effective as a good, fine-pore paper air filter from the single standpoint of trying to block the passage of dust, and its efficiency actually improves with the accumulation of particles on the element's surface. A new, clean filter of this type will operate at about 99.5-percent effectiveness; after collecting a light coating of dust efficiency will rise to virtually 100-percent and to that extent paper is the absolute king of filter media.

The single serious shortcoming of paper filters is their inability to carry a big load of dust. They won't pass a lot of air in terms of flow per square inch of surface, but the common practice of forming the material in close-spaced pleats provides a very large total surface area for a given overall filter size. Unfortunately, the paper element filter's flow capacity falls very sharply as it becomes coated with grit. Desert riders long since have learned that any paper filter small enough to fit on the motorcycle will not have the dust capacity required to cope with the load acquired in even a single off-road event.

A secondary problem directly linked to overloading of the paper filter's element is that of mechanical failure. Motorcycle engines gulp their air in sharply defined chunks and this creates intake tract pulsing, which tries to tug the filter element back and forth. The pulses are not felt too strongly when the filter is clean and offers little restriction to the passage of air, but when dust accumulates and the restriction rises there is a push-pull working of the paper that may well lead to an outright fracture. When that happens you have a hole in the filter and the dust can stream right through to the engine, which instantly becomes a very poor insurance risk.

Paper filters should not disintegrate just because they get wet, though some do, but water will bridge the pores and make the element nearly air-proof. Add a little dust with the water and you'll have an air filter that is, to all practical purposes, plastered over—and one that does not wholly recover when dried.

Another whole category of air filters relies strictly on the fact that dust particles are heavier than the air whisking them about. Most of these employ vanes to spin the air passing through them, and the rapid rotation hurls the grit outward where they are caught in a trap. These centrifugal separators are commonly used on construction equipment, but almost never as the sole means of cleaning intake air, as they only remove about 80-percent of the grit and the remaining portion is enough to do the engine a serious mischief. The separators are employed primarily to protect a second downstream filter—usually paper—from too-rapid loading.

And then we have the currently very popular impingement-type filter, which traps particles by catching them in a maze. This entrapment can be mechanical: if the filter material is a matt of fine, springy fibers the bits of grit will become wedged and be held there until some counterforce dislodges them. But the counterforce is almost automatic in motorcycle engine applications, provided by intake pulsing. Thus, the polyurethane foam and gauze filters now in such widespread use are intended to be saturated with high-viscosity oil, though some people neglect that vitally important step.

Whether foam or gauze, the oiled impingement-type filter works by making the air zig-zag as it passes through. Particles of grit, being heavier than the air, tend to keep going straight and thus strike one of the walls in the maze—and are held there by the adhesive action of the oil with which the filter is saturated. Actually "saturated" in this context means that all the filter's surfaces, exterior and interior, are coated with oil. They are sticky, and will do an excellent job of holding some kinds of grit, under most conditions.

A problem with foam filters is that they, like the paper-element type, will flex violently with intake system pulsations. The difference is that the foam elements don't fracture; they just flex a lot, and as it happens that's both good and bad for the filtering process. The flexing is good, to the extent that it helps shake off accumulated grit and keeps the element's comparatively limited surface area from becoming blocked. But the shaking also is bad, for it tends to encourage the migration of particles through the maze and into the engine. It is unlikely that such migration will occur with the foam well oiled; there is a tendency for the element to dry, due to absorption of oil into the surface coating of dust, which is then flaked away by the induction pulsing and more dust collected in its place.

Obviously, when the foam filter relies so heavily on its interior/exterior coating of oil for efficiency, the *kind* of oil doing the coating is very important. Ordinary motor oil will work, but the heavier and more viscous oil you use the better job of filtering the foam will be able to do. And regular maintenance is an absolute requirement: the foam filter should be washed and re-oiled after every outing.

K&N's pleated gauze filters employ the same operating principle as foam filters, leading the air through an oiled maze. The big difference here is that the construction—with a gauze pad sandwiched between layers of coarse screen—is such that a very large surface area is provided. It may be, too, that the general fuzziness of gauze creates a tighter maze than foam and will do a better job of filtering.

Our problem in trying to gauge the efficiency of the oiled-maze filters is that very little reliable data on these items has come to light in our researching. We have obtained a handful of SAE papers that deal extensively with other forms of air filtration, but we cannot honestly comment on how well the foam or gauze filters cope with various kinds of grit. There is an inference in the material we have at hand that they really are not as good at trapping the small stuff as they should be.

On the other hand, the foam filters do a superb job of keeping the air moving when the dust is so thick you can't see your bike's front wheel. Dust may cake thickly around the outside of the foam, but then when it verges on blocking the air a cake will be flaked away and the air will keep moving. It is unfortunate that the bare patch won't filter as well as areas that are just lightly covered with dust, but the foam filter will keep right on doing a pretty good job until the oil is all absorbed and disappears with the flaking dust. That puts the foam filter well ahead of paper elements for the off-road rider, because the paper filters will quickly load to capacity and may very well suffer the kind of pulse-induced fatigue fracturing described earlier. The foam filter isn't quite as effective as paper when both are fresh, but will continue to do its pretty good job while carrying a load of dirt that would ruin the more refined type. The message here, in case you've missed it, is that foam and gauze filters are most appropriate for coping with extremely dusty conditions; paper-element filters are best when the air isn't so filthy that their dust capacity is instantly overwhelmed.

Inventive minds probably will have already begun to put one and one together,

(Continued on page 89)

AIR FILTER COMPARISON

	Oil Wetted Mesh	*Oil Wetted Foam*	*Formed Felt*	*Pleated Felt or Paper*	*Two-Stage Pleated Paper*
Comparative dust capacity in	low	medium	low	medium	high
given volume Overall Efficiency	very low	low	medium	very high	very high
Effect of external pre-cleaner on overall efficiency	not used	not used	not used	increase	increase
Engine protection if cleaner service is neglected	variable	poor	poor	excellent	excellent
Tolerance for fibrous material and snow	poor	poor	fair	good	good
Tolerance for rain entrance	good	fair	fair	good	good
Tolerance for sooty exhaust smoke	not affected	good	fair	fair to poor	poor
Ability to perform well under widely varying temperatures without attention	fair	fair	excellent	excellent	excellent
Effect of engine inlet pulsation on efficiency	lower	lower	lower	variable	generally no effect may increase or lower
Other effects of inlet pulsation	may disintegrate	none	none	none	pre-cleaning efficiency
Effect of vehicle bounce	none	none	none	none	none
Effect of variable airflow	none	none none	none	none	lower pre-cleaning efficiency
Service supplies required	solvent and oil	solvent and oil	new element, or possibly cleanable with water or air water or air	new element or possibly cleanable with water or air	new element or usually cleanable with water or air
Relative cost	low	low	low	medium to high	high

OIL FILTER COMPARISON

Pleated Paper with Exterior Wrap Oil Wetted	*Pore Size, pores/inch*	*Wrap Thickness, inch*	*Initial Net Restriction, in. wg.*	*Efficiency, %*	*Dust Capacity, gr, Standard Coarse*
	—	—	0.3	99.4	120
1	80	0.5	0.7	99.8	100
2	65	0.9	0.7	99.8	142
3	55	0.9	0.7	99.7	195
4	40	0.5	0.5	99.7	240
5	20	0.5	0.4	99.9	455
6	10	1.0	0.3	99.9	656

THE CHARTS PRESENTED HERE CONTAIN INFORMATION ABSTRACTED FROM SAE PAPERS

YAMAHA CAMPER

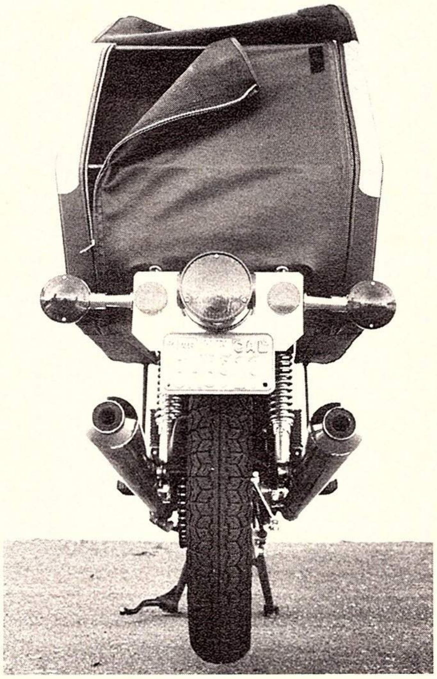
A cross-country bag for motorcycles and the great outdoors

By Phil Schilling

● Yamaha has gone into the package-tour business. As you might expect, Yamaha's deal has nothing to do with high-altitude trans-oceanic travels. The package, developed at Yamaha Parts Distributors Incorporated (the accessory arm of the American importer) is highway-bound. The company has introduced "the Yamaha Cycle Camper" which YPDI calls "a totally new concept in motorcycle camping."

What's really new is the package deal. For $299.95, you can buy a specially designed motorcycle tent, mummy sleeping bag, three-quarter length sleeping mattress, butane cooking stove with gas bottle, cook kit, plastic water bottles, and a night-light powered by the bike's battery. Also included is a steel-framed vinyl bag which carries the gear and a telescoping rack that mounts the bag to the motorcycle. Heavy socializers will be delighted to discover that the vinyl carrier has room for another sleeping bag, and for that matter, extra clothing and food.

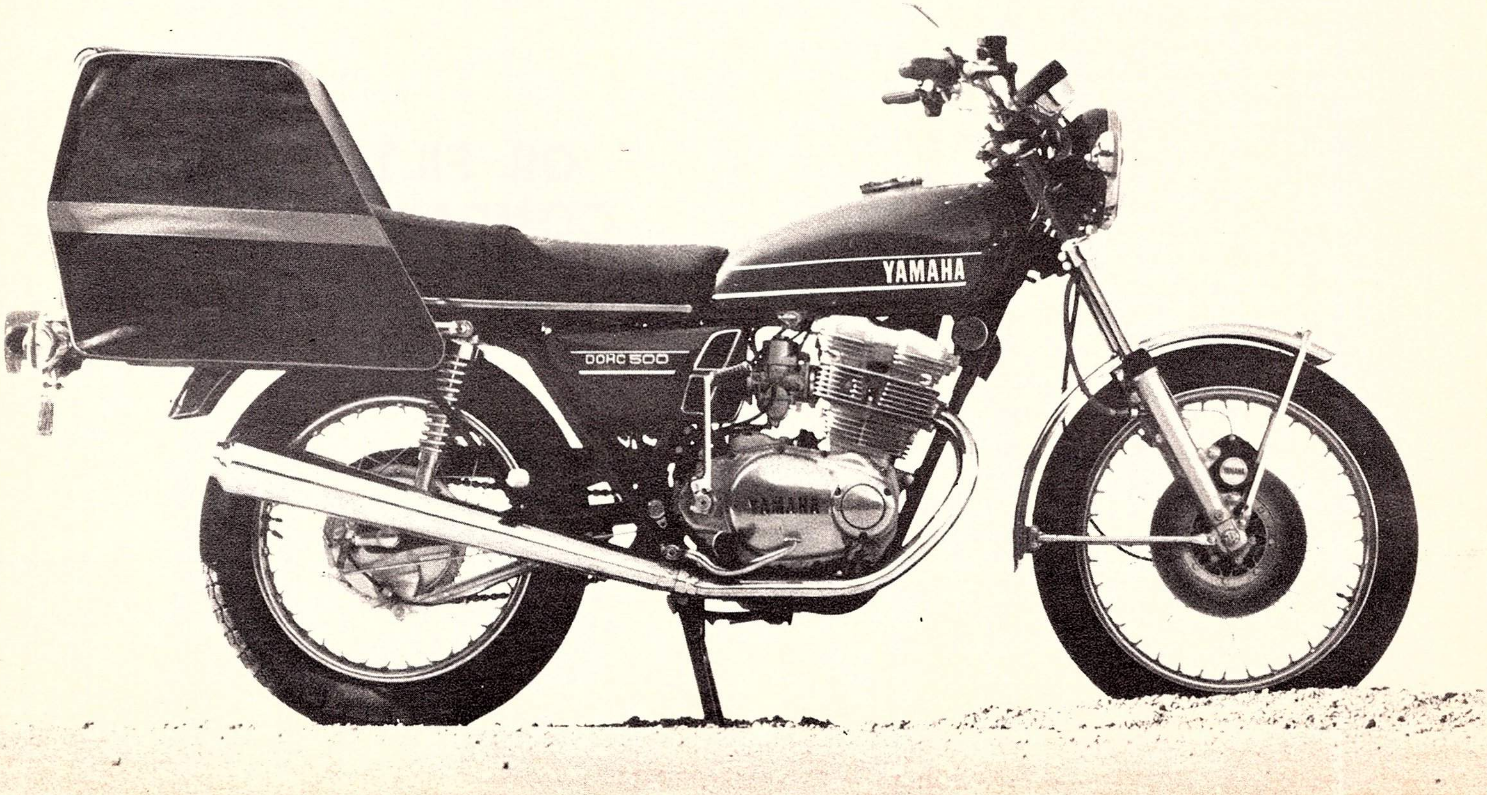
Those who like this $300-idea will be twice blessed should they own certain Yamaha models. The camper bolts directly onto 1973 and 1974 250, 350 and 500 Yamaha street machines, and 1974 250 and 360 Yamaha Enduros. The camper can be adapted to other motorcycles, but such adaptations should be carefully made. The rack ought to be attached securely; any sloppiness could produce a very unstable bag at speed. Besides, YPDI has engineered and tested the camper on Yamaha models; those who modify the outfit for other bikes will necessarily become their own testers so far as handling is concerned.



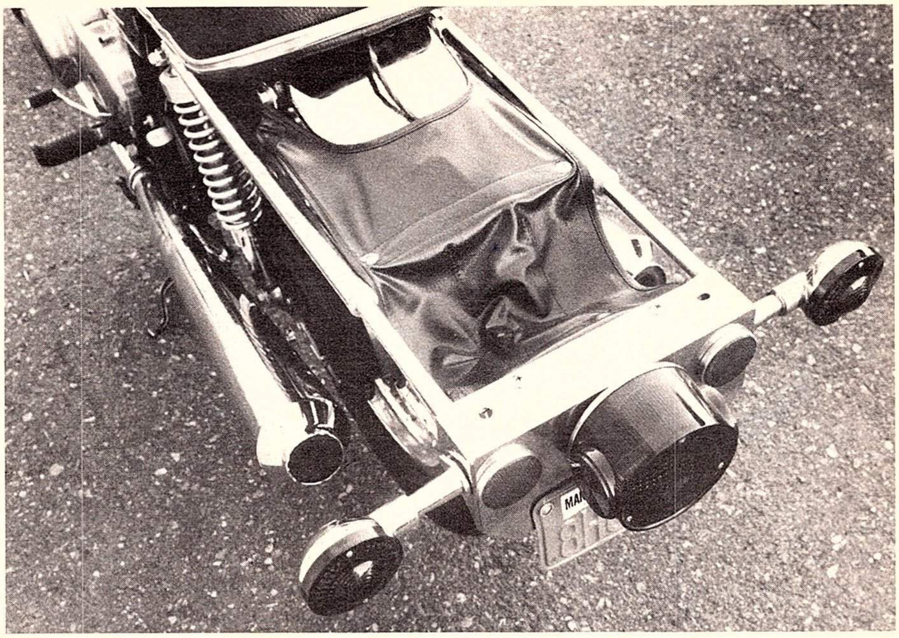
Cycle tried the Yamaha Cycle Camper on a TX-500A. We were happy to see the camper hooked to a 500; no staffer would use a 250 or 350 for packing a lot of gear and hauling a passenger. The 55-mph speed limit not withstanding, a half-liter engine is the basement limit for heavy-duty two-up travelling. With smaller bikes, we suggest short outings: set up camp in the wilds of a nearby park.

The foundation of the camper system is the rack and its vinyl bag. The rack

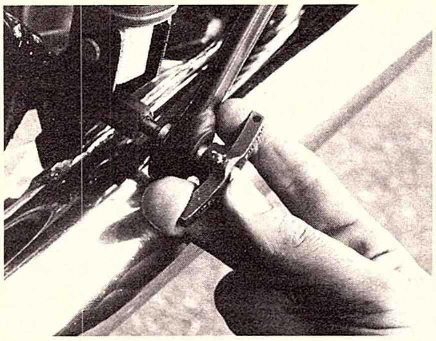
In its full rearward position the bag telescopes back to uncover the rear portion of the seat. All weight in the bag will fall behind rear axle.



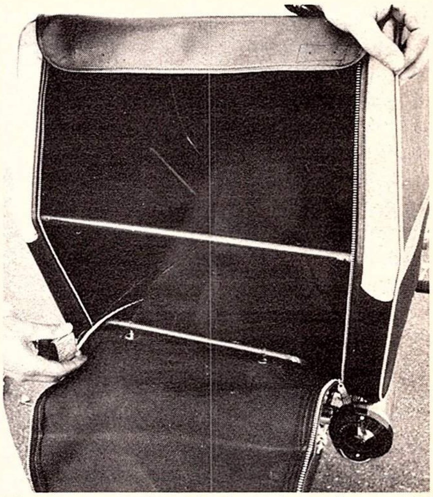
PHOTOGRAPHY: BILL DELANEY



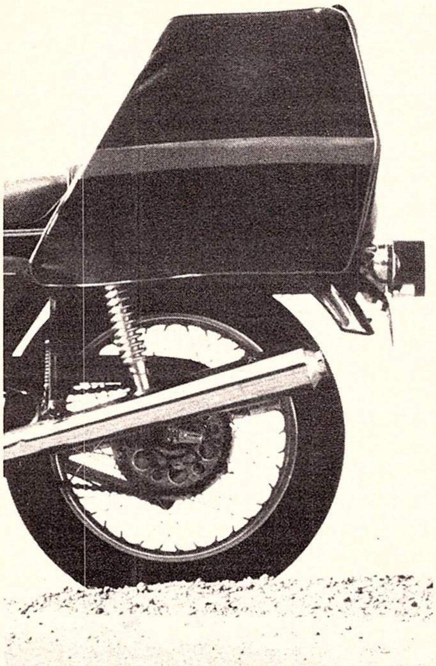
The rack slides on nylon bushings; bag-attachment holes above reflectors distort with use.



T-handle provides quick-detach point; rubber bands would bother passenger if carried.



Measurement through the side pockets is 23 inches. Frame member doesn't greatly interfere with loading.



For one-up riding, the bag pulls in behind rider. In both modes, the bag is quick-detachable.

can carry its container in one of two positions. Should the rider be alone, the rack can be set so that the vinyl bag occupies the passenger space.

To carry a passenger, the rider can click down a spring-clip locking mechanism on the rack's right-side rail and pull the telescoping rack back into its rear position. This maneuver fully uncovers the seat, and the bag provides a useful back rest for the passenger.

The tail light and directional signals necessarily must be moved to the back of the rack. There's no problem in the transfer—the camper kit has the support bracket for the lights and a tunnel for the wiring harness.

The vinyl carrying bag is quick-detachable. With the rack in its rear position, one releases the rubber banjo straps which run from the front of the bag downward to T-handles by the passenger's footpegs. To release, push the catch buttons in and pull the T-handled rods out of their bores. Then the rider tips the bag on its lower trailing edge and lifts up. This allows two retaining hooks on the bag's frame to be withdrawn from the anchor holes on the rack. In all, it's a fifteen second operation.

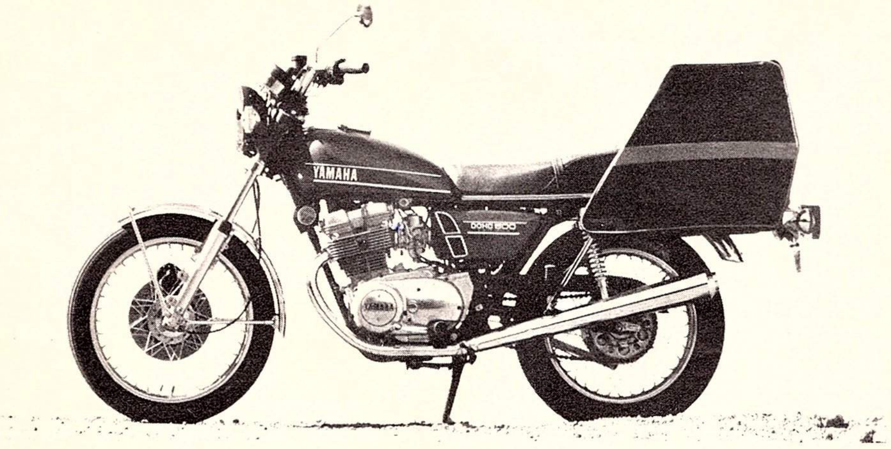
Since the QD system requires the rack to be in its rearward position in order to remove the bag, the rack gets shoved back and forth regularly. In muscling the telescopic rack, it's tempting to use the turn-signal mounting arms as convenient handles. Alas, that's a good way to bend and loosen the arms. The rack could use small handles on the back for the pushing-and-pulling operations. Furthermore, the rack holes—into which the vinyl bag's prongs drop—become slightly bent and elongated with use. The area surrounding these holes could well stand some reinforcement.

The vinyl container is far more than a bag. Essentially, it is a steel frame covered by tough vinyl. The unit unzips at the back allowing access; to close, the two zippers go up and a top cover folds over, sealing the open juncture between the main bag and the top of the flap. Velcro fasteners hold the top cover down in place.

While the vinyl bag will repel water, it's not waterproof. The contents remain safe in a short drizzle; a long or hard rain would allow water to soak through. There were a couple of places in which our test camper would leak. Specifically, where the rubber banjo cords (which attach to the steel framework) passed through the vinyl, there were gaps which would pass water. Silicone seal would likely plug the gaps.

The central advantage of the vinyl bag is its capacity: the rider can stuff all his gear under one cover. The bag eliminates that elaborate system of bungee cords which lashes five or six separate pieces onto an open rack. Nevertheless, one can't toss things in the bag indiscriminately. The load should be balanced—and secured well enough so that it won't shift dramatically at speed. Carelessly packed sharp objects could put holes in the vinyl. While more vulnerable to abuse than fiberglass saddlebags, the Yamaha container has more space. Though the bag has provision for locks, vinyl will still yield to a knife. Riders who worry about theft can take the QD container with them, at least for short distances. On the other hand, the QD feature can work against the owner since a quick-handed thief could make off with the vinyl bag in a flash. Yamaha would do well to devise a method by which the bag could be locked on the rack.

The bag with included contents weighs just under 28 pounds. A second sleeping bag, clothes and canned food could raise that total to 45 to 55 pounds. The Yamaha camper creates more space than traditionally available to the motorcyclist, and this encourages a tendency to utilize all available space. Travellers generally pack to the limit of space, and not to the bare essentials. Motorcycles are certainly space-restricted vehicles, but the Yamaha camper gives the rider as much space



under one cover as he's likely to get outside of a tow-trailer.

If a motorcyclist is traveling solo, he'll be inclined to drop the camper in its double-up position, and then use the space on the passenger's seat to strap on more gear. The total weight solo probably won't overtax a 500.

Total weight becomes an important consideration in any discussion of two-up touring with extra equipment. Now new motorcycles carry GVWR numbers, and GVWR stands for Gross Vehicle Weight Rating. There are three GVWR figures stamped on the TX-500, as well as on other street and trail machines. There's a total figure, and figures for front and back. Assuming that the rider wants to stay under the GVWR numbers, just keeping below the total figure isn't enough; he must also stay under the separate figures for front and back. To illustrate with the TX-500, the GVWR-conscious rider would stop loading when the total weight of motorcycle, riders, and cargo reached 785 pounds, or when the weight measured at the rear tire exceeded 520 pounds, whichever occurred first.

Imagine your surprise when you start doing some simple addition and subtraction. As tested in the July 1973 issue of *Cycle*, the TX-500 weighed 456 pounds wet. So—at the very best—you can add no more than 329 pounds before exceeding the Gross Vehicle Weight Rating (785 pounds), assuming of course that you don't go over the 520 gross on the rear first. If only the rider does the trip, there's no problem. He can mount the camper and lots of other gear on the motorcycle. However, the rub comes when a passenger is added. A 175-pound rider and 130-pound passenger totals 305 pounds—adding the camper would push the total beyond the Gross Vehicle Weight Rating.

Why not ignore the Gross Vehicle Weight Rating? Certainly a great number of touring motorcyclists do just that, by piling on racks, saddlebags, piggy-back gas tanks, fairings, radios and anything else that might bolt on. The motorcycles will handle it—won't they? And that question raises yet another: is the Gross Vehicle Weight Rating figure the same thing as maximum loaded vehicle weight? Not exactly. The GVWR is a ballpark figure. It allows a manufacturer to represent the overall capacity of a vehicle without being tied to an exact maximum limit which is specific to the last ounce.

According to the information which *Cycle* received from the Department of Transportation, it's the DOT's "intent to allow manufacturers, in stating GVWR and GAWR (Gross Axle Weight Rating), to select values that represent the overall performance figures of their vehicles as delivered, without necessarily varying the values to allow for minor weight variations in a particular line of vehicles." Suppose, for example, one customer wanted his new motorcycle delivered with an optional 5.8-gallon gas tank, while another buyer ordered the "small" standard tank. The tanks don't weigh the same. Were the manufacturer held accountable to the last ounce, he might need a different maximum weight and payload figures for every slight variation in every model in his line. The GVWR—as ballpark figures—have their merits.

Some time ago, the DOT observed that manufacturers had a natural interest in holding down Gross Vehicle Weight Rating figures. Why? The lower the ratings, the less responsibility a manufacturer may have for a product failure. Think about it. If you were a manufacturer of a 50cc machine, you'd have far fewer customer complaints with the bike's GVWR set at 300 pounds rather than 1000 pounds.

The Department of Transportation didn't want manufacturers to understate the GVWR figures, so the DOT developed a very specific definition for Gross Vehicle Weight Rating. The stated GVWR "shall not be less than the sum of the unloaded vehicle weight, rated cargo load, and 150 times the vehicle's designated seating capacity."

What, you may inquire, does all this have to do with the TX-500 Cycle Camper? Plenty. In the first place, it's certain that two normal-sized Americans, packing off on a camping trip and carrying a reasonable amount of gear for that trip, would exceed the GVWR on the TX-500. Further, it's clear that Yamaha overlooked the GVWR problem before they introduced the Cycle Camper; otherwise, Yamaha would have (because they could have) boosted the GVWR ratings for the TX-500—and all their other "camper motorcycles." Third, it seems apparent that Yamaha, like other manufacturers, initially determined the GVWR figures in a very simple way. They took the weight of the motorcycle, added 300 pounds for the rider and passenger, and tossed in 30 pounds for cargo load.

A customer who operates the TX-500 with Cycle Camper at weights in excess of the bike's GVWR does so at his own risk. Despite the fact that Yamaha is selling the product as two-up-for-camping, and despite the plausibility of that concept, the fact remains that the TX-500 has, at the time of this publication, only been certified for a GVWR of 785 pounds. That figure is stamped on the motorcycle for the *consumer's* information. If you exceed that figure and have an equipment failure, the grief is on you.

Okay, you say, thanks for the lecture on GVWR. But the GVWR figures are still ballpark numbers, and certainly Yamaha has some kind of safety factor fudged in, and I'm willing to lean on that factor at my own risk. Is there, you inquire, some kind of maximum limit beyond which only registered fools would travel? The answer is yes, and the word is tires.

A motorcycle manufacturer can raise his GVWR figures only so far, and in general the loads which specific tires can safely carry determines the absolute upper limit. Tires are not always the "weakest link." It's possible in some cases that other components, such as spokes or hubs, might dictate limiting figures. In any event, *tire manufacturers* certify the maximum loads which given tires can bear at specified pressures for safe use, and federal governmental agencies are involved in setting these limits. For example, a 4.00 x 18 tire (4 ply rating, B-range) at 32 psi, which is the highest inflation pressure permitted, is rated at a maximum of 610 pounds. The TX-500 carries such a tire on its rear wheel.

You'll remember that Yamaha's GVWR on the rear is 520 pounds. Between 520 and 610 you're travelling at your own risk. Above 610, you'll overload the tire. In theory a TX-500 might bear 2000 pounds, but that's beside the point. The rear tire is certified for 610 pounds @ 32 psi. If you have a tire failure due to an overload, it's your negligence. The tire manufacturer can't be held responsible and neither can Yamaha.

Cycle Staffers believe that the GVWR should not be exceeded in the interest of common sense. Staffers firmly believe that the tires should not be overloaded in any circumstance. Therefore, so far as the TX-500 with Cycle Camper is concerned, something would have to go: passenger or camper. Take your pick.

As delivered, with the bag positioned forward or back, the TX-500 did not develop Dr. Jekyll road manners at normal touring speeds. With 20 additional pounds in the bag, nothing untoward occurred—the stability was still there. Gusty sidewinds didn't push the bike around, even though the vinyl bag makes quite a sail. Readers should note that we did not exceed 55 mph, and we did not pack double. We do, after all, follow our own advice. Additional weight in the camper was concentrated as low as possible. Compared to *Cycle*'s 1973 test bike, the 1974 TX-500 with Cycle Camper had stiffish suspension, different tires, and greater driveline slop. Obviously, scratchers will not like the TX-500 with Cycle Camper, and they would not much care for this particular TX-500 without the Camper. We certainly did not race madly about on back roads with the full get-up on board.

Nor would motorcycle tourists. Motorcyclists who actually travel on motorcycles normally ride with a degree of reserve; landing upside down in a ditch a thousand miles from home doesn't get it. Tourists are likely to have all sorts of specialized equipment hanging on their bikes (handlebar fairings, saddlebags, racks and radios) so razor-sharp handling just can't be Priority One. For the touring motorcyclist, the machine must be something of a transporter-truck; and trucks, no matter how good, aren't sporting racers.

Unfortunately, Yamaha is not currently selling the rack-and-bag without all the camping goodies. Some touring motorcyclists are motel lodgers, since no one yet has found a way to pack a good hot shower. Others are avid campers *and* motorcyclists, and they already have all their camping gear. Like motorcycling, camping is an enthusiast's activity; there are those who can lecture on ground-stakes like motorcyclists hold forth on the merits of shock absorbers. You would no more pick a tent for someone else than pick a motorcycle for him; it's an individual thing. So neither motel lodgers nor confirmed campers need anything more than the bag-and-rack. But the basic Yamaha deal remains: if you want the bag-and-rack, you must take the whole thing—tent, stake and cookware.

Yamaha is selling a system. They'll put you on the ground floor of the motorcycling/camping experience at a package price. The specifications of the camping equipment are: two-place (waterproof) nylon taffeta tent, with an outer tent fly; mummy bag with European hood with Polarguard insulation; a three-quarter mattress with open-cell foam and waterproof nylon covering; and E.F.I. Mini-Stove with a nine-ounce LP gas fuel bottle; a five-piece cook kit in spun aluminum; two one-quart plastic water bottles; and a night light and tent wiring harness (street models only).

The Yamaha Camper is a good way for beginners to buy the basics for motorcycle camping. Touring motorcyclists who already own specialized camping gear still may buy the Yamaha system because they want the bag-and-rack and because they can find a use for the kit items. The motel contingent is just out of luck; they can't buy the bag-and-rack separately right now, and they wouldn't have any use for the camping gear.

Eventually, however, we think Yamaha will offer the bag-and-rack separately for two reasons. First, when a customer bends up his steel-framed bag in a crash, he'll need a replacement and he won't want to buy another entire camper. Second, Yamaha's idea has sufficient appeal to draw accessory manufacturers—if not into the package-tour business, then at least into racks-and-QD bags.

One final thing is abundantly clear. Though the Yamaha Cycle Camper seems an attractive way to go double-up camping, the gross vehicle weight rating figures will cut across the fun in many cases. If you observe the weight rating figures which are stamped on the motorcycle, then there's just no way the TX-500 can carry a 175-pound rider, a 130-pound passenger and the camper. The Yamaha Cycle Camper is a good idea for the rider going alone. For double-up touring with normal-sized Americans, the camper is an idea in need of an overhaul. ◉

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CAN YOU PICTURE IT?

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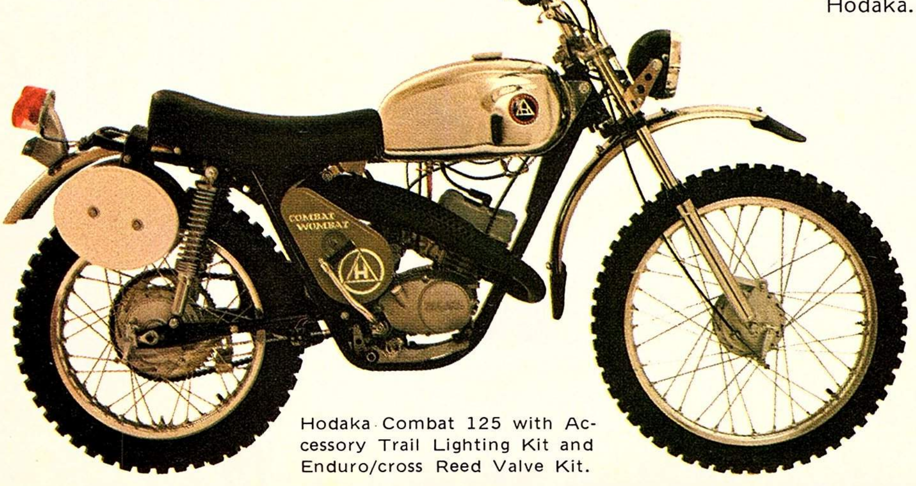

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CIRCLE NO. 28 ON READER SERVICE PAGE.

BASICS: FILTERS *Continued from page 81*

and realized that it should be possible to combine one foam filter with one paper filter and have the best characteristics of both. And we have some hard data concerning precisely that kind of combination. Canadian researchers took a standard paper-element air filter and tested it first by itself, and then with various oiled-foam wrappings. Alone, the paper element would capture 99.4-percent of a standard grit and was carrying 120 grams of grit when the through-filter restriction was equal to a vacuum capable of lifting a column of water 10 inches. The vacuum was only 0.3 inches of water with the filter new and clean; the cutoff point for all tests was the 10-inch point.

With a wrapping of half-inch foam having a density of 80 pores per square inch the filtering efficiency rose to 99.8-percent, which was encouraging, but the dust capacity actually dropped to 100 grams. Then an inch of 65 pores/square-inch foam was tried, without changing the efficiency but raising the dust capacity to 142 grams. Foam wrappings of 55 and 40 pores/square-inch lowered the filtering efficiency slightly, to 99.7-percent, but improved the dust capacity to 195 and 240 grams, respectively. An even more coarse foam of 20 pores/square-inch, and 1/2-inch in thickness, picked the efficiency back up to 99.9-percent and gave the combination a mighty 455-gram dust capacity. But the very best results were obtained with an inch-thick wrapping of extremely coarse oiled foam, 10 pores/inch, and while the filtering efficiency remained at 99.9-percent the dust capacity reached 656 grams.

A coarse foam pre-cleaner will increase the service life of an engine's primary air filter by removing some of the incoming dust; an equally effective approach is to place the air inlet in a relatively dust-free area on the motorcycle. Virtually all motorcycles draw their engine-air from somewhere around the under-seat area, and this seems to be the worst location possible. Dust churned up by the bike's rear wheel is picked up by air turbulence behind the rider's legs and back and forms a thick, gritty cloud enveloping the entire rear section of the machine. A much better point of entry for the air would be ahead of the rider, and up near the handlebars.

Filters' air capacity may effectively be increased by providing a clearance volume between the carburetor and the filter element. With the filter element placed directly in front of the carburetor mouth you have to cope with very high peak flow rates; put some volume between carburetor and filter and it will damp out the peaks and fill in the pauses. An engine that requires a total of, say, 100 cubic feet of air per minute will have peaks of 600 cubic feet/minute if it's a four-stroke and the instantaneous demand may go as high as *twelve-times* the average in two-strokes.

And what of the other motorcycle filters? Most bikes have fuel filters of one sort or another, and oil filters are coming into wider use—which is very encouraging.

Oil filters take two forms: centrifugal separators and sieve-type strainers. The former have been used on thousands of Hondas, which feed their oil into a small crank-driven drum with interior vanes. There the oil is spun fast enough for centrifugal force to plaster the grit out against the drum's walls, from whence it is removed by the owner in the course of periodic servicing.

Probably those centrifugal oil filters are no more efficient than their air-cleaner equivalents. Certainly the paper-element oil filter has come into almost universal application, and there is little reason to try anything else. The paper-element filter can remove all particles much above a micron in size, and it doesn't have to be very large to last for many service hours before it is in any danger of becoming clogged—especially if the engine has a good air filter and grit is not allowed to enter the oil supply from that direction. Of course, periodic replacement of the filter element is absolutely necessary because all modern engines have a spring-loaded bypass valve that directs oil around the filter when the element becomes so loaded as to present a serious obstruction. The "full-flow" filter is what its name implies only when it is clean.

Fuel filters are necessary because there always will be a certain amount of water condensing on a motorcycle's fuel tank walls. This water causes rusting, unless the tank is made of plastic or fiberglass, and both the water and rust tend to work their way down into the fuel lines, moving toward the carburetor. Any kind of in-line strainer, even if it's just a fine-weave screen, will stop the rust flakes before they get to the carburetor. But water requires a special trap-type device, a bowl where it can collect instead of travelling with the fuel down to the carburetor. You may think a few beads of water can't do any harm; the fact is that they will lodge in a carburetor's smaller orifices like rubbery globs and block the flow of fuel.

Engine life, whether it is defined as hours to failure or the number of hours before performance deteriorates, is very much a function of engine cleanliness. The engine has to be protected against contamination from its fuel, provision must be made for removing contaminants—once in—from the oil supply (even if this must be accomplished with frequent draining and refilling) and it especially must be protected against grit coming in with the air it breathes. Your café racer may look spiffy as all get-out with its velocity stacks. But remember: unless you clean its air with a good filter, your engine is going to look like a train wreck inside, and inside is where it *really* counts. ◉

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CIRCLE NO. 29 ON READER SERVICE PAGE.

RACER ROAD *Continued from page 77*

and there are people who swear he crossed the finish line backwards.") I had talked with Peter Graveson of the British Police about it; Peter found it "bloody difficult," and Peter is a whiz.

It was raining, so the three of us explored by car. How bad could it be? I kept wondering. The Lizarietta is to the Pyrenees rally what Turn Nine is to Riverside and what Turn Two-Three is to Mosport: the key. There are enough talented riders at the Pyrenees to guarantee a ton of zero scores on the route and on the Bois du Bager. Which leaves the Lizarietta to separate the greats from the pretty-goods. By itself it determines the winner. It's the linch-pin of the event, and a thorny, cruel linch-pin at that. It is to roads what the razor-studded potato is to street-fighting. The sight of it cooled my enthusiasm. But not everybody's.

Although you have never heard of the Pyrenees rally it is a major European event, and the people who come there to win are on fire with the same loosely-controlled desperation that quality competitors bring to any event they take seriously. The rally is at bottom a war between the French and British motorcycle police. The British contingent had stuffed all but two motorcycles in practice sessions during the week. The French had done as much practicing and almost as much crashing, and had gone the British one better by painting notes to themselves on the Lizarietta's meaner curves. To people who were out to win (possibly because they stood to lose a lot by losing, like their place on the team), that unholy hill was flinchy but surmountable; the limit of reasonable risk was high enough for them to wind up and take their hardest cut at it. For the rest of us the risk overpowered the reward. We thought it would be nice to do well; they knew it would be disastrous to do poorly. Which is one of the several reasons they squinted their eyes, clenched their teeth and attacked like sharks in a feeding frenzy, and the rest of us did not.

There were ceremonies to be attended back in Pau, so after a few queasy trips up and down we left the brooding Lizarietta and headed home. We washed the bikes and rode to the Place Royale, a tree-shaded square in the middle of town, and parked. The square was packed with nests of identical BMWs and Honda 500s and Norton 850s belonging to different European police forces. Grand entrances were made in formation; the loudspeakers ripped the leaves at full Gallic crescendo; photographers clicked amok; children paraded down the street; we lined up to collect our gasoline vouchers and our route sheets. The sheets showed our required time of arrival at each of the checkpoints, afforded blank boxes for penalty points and spaces for the hill-climb scores. The Elf Oil Company provided to each competitor a fistful of gasoline vouchers and 200 francs start-money, and to the event incalculable logistic and financial support. Much fuss was made over Neale Shilton, regarded as the Pyrenees Patriarch, and over me, because I was the first American to participate in the rally. We then gathered ourselves together and 140 of us paraded in a drenching rainstorm through the streets of Pau, after which Colquhoun and I rode back to the hotel and began preparing for the Sunday morning start.

My starting time was a little after seven the following morning. All of us were up early and fed, and we proceeded through the silent streets of Pau to the first control, at the Alles du Grand Tour. The smaller bikes had begun to depart at 5:30 a.m., and Colquhoun, Blair, Shilton, Juan Rodes and I were surrounded by 903 Z-1s, 900 BMWs, 750 Hondas and hosts of other Nortons. Juan Rodes is one of Norton's biggest dealers in Spain, and a good friend of Keith Blair's. He had driven to Pau Saturday, and faced the starting line that quiet, rich Sunday morning without so much as a mile of practice. Keith had rehearsed him late Saturday evening, warning him about the Col du Souloir, the Bois du Bager, and the Lizarietta. Rodes seemed capable and together.

Blair, riding on Number 78, was first away, followed by Colquhoun (79), Shilton (80) and me. We had practiced the route out of town. As soon as I left the starting control and plunged the wrong way down a one-way street (which was how everybody else was going) I knew we had practiced the wrong route to Ferrieres. By the second intersection, however, my direction-finding technique had been perfected. Approaching a crossroads I would take both hands off the bars and raise them in an attitude of alarm and bewilderment. Invariably someone watching would gesture hysterically in the proper direction. I did it even when I knew where I was, just to make sure. It worked for 321 miles.

I caught up with Colquhoun and Shilton at Ferrieres, the first check point. It was a lovely morning, clear, fresh, dampness in the air, and when I leaped up the Col du Souloir every system in my body that has to do with rapid motorcycling was functioning immaculately. I saw with absolute perception; I felt what the tires were doing, and what they were likely to do; I manipulated the hand and foot controls without the effort of conscious thought. I had been elevated by the event and the weather and my own adrenalin to sublime rapport with the bike and total communication with the road and I gusted up the mountain, dodging gravel and spots of water, riding better than I have ever ridden in my life, soaring inside with the luminous perfection of it all.

The fogbank waited at the top of that first mountain. My speed up had been more than a minute quicker than our practice time, and since the practice time was good enough I thought I could bluff my way through the fog, on momentum if nothing else, and get to Gourette on schedule. But it grew thicker by the time I got to the first tunnel and thicker still the far side of the second tunnel, and finally so thick that I could hardly see the pavement beneath the front tire or my dripping fists on the handlebars. The road was wet and the drop-offs were made even more terrifying by their invisibility. I couldn't see through my face-shield and finally had to loosen the helmet strap, tilt my head back as far as it would go and peer out underneath. It was hopeless to try to go faster. So I went as fast as I could and prayed that the two or three minutes I had put in the bank on the rocket-ride up Souloir would cover the debt that mounted in the clutching, pewter fog.

Across the face of the mountain and up to Aubisque. At the peak of the second mountain the road turns sharp left and begins a supple plummet into Gourette. There was activity on the outside of the left-hander. It was Keith Blair. He had ridden off the macadem and deep into a muddy ravine, and had bruised a nerve in his shoulder. The bike was just out of the ditch by the time I got there, dripping silt but otherwise undamaged. A few minutes after I passed and dove down the mountain Juan Rodes, riding Number 84, missed the same corner, knocked Blair's Norton back into the ditch and put himself out of commission with a mangled hand.

In the midst of all this activity I had again caught up with Bill Colquhoun, and together we piled into the Gourette check for the bad news: I was three minutes late and Bill was four minutes late. I collected 180 penalty points, Colquhoun 240. Later we heard from Blair that subsequent to our passage a puff of wind came up and kicked the fog off the mountain, leaving the French Gendarmerie (who had been assigned numbers in the 110s and 120s) with a clear road and easy pickin's.

We split for Montory, the second check, and were back on schedule by the time we arrived. The fog was gone and the beauty of the twisty roads and the towns they linked revived my enthusiasm. But before we got to Montory the Bois de Bager hillclimb had to be reckoned with, and the magic that suffused me and the Norton going up the Souloir vanished when we skidded around the Bager's first mossy corner. My rhythm was off and I was several seconds slow.

It was easy from there all the way to Espelette. I arrived five minutes early and had time to refuel before punching in. A few miles down the road was the Col de Lizarrieta and just beyond, on top of the mountain, the Spanish border.

The course is laid out in a giant figure-eight, except there are three loops instead of two. Saint Palais marks the first intersection, Espelette, roughly, the second. Because we passed through Espelette

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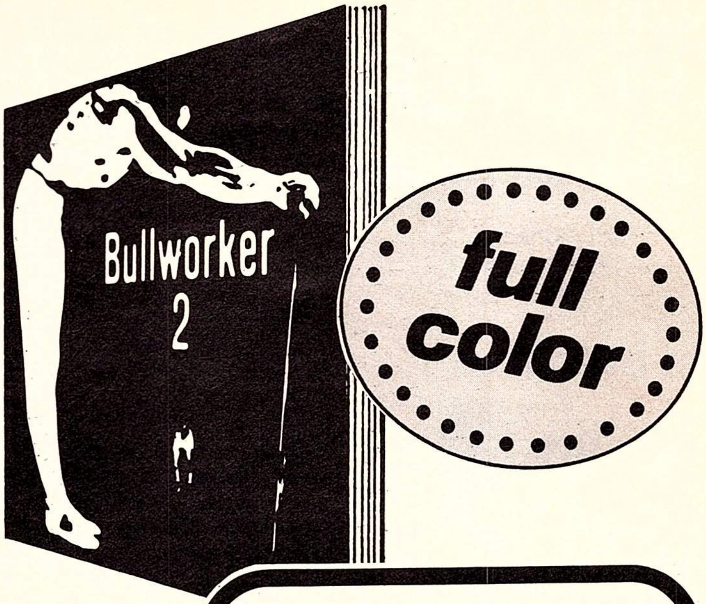

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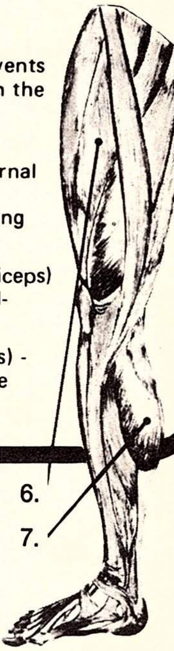

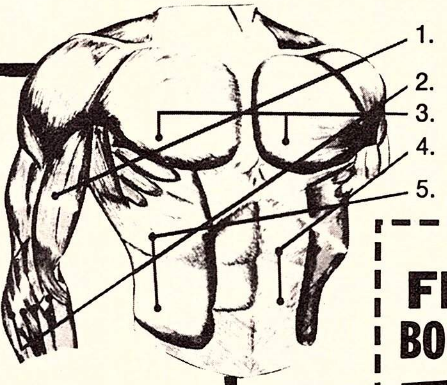

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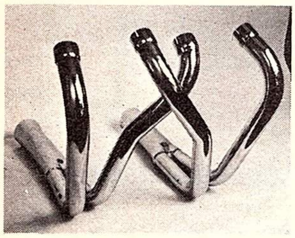

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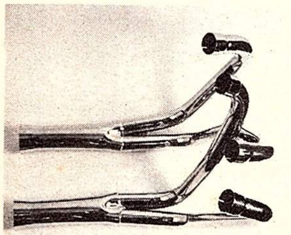

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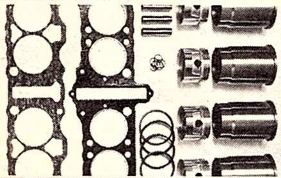

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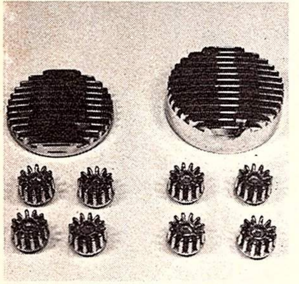

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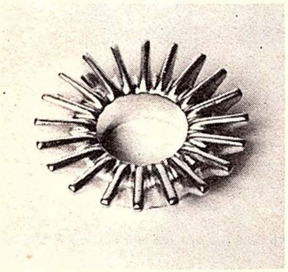

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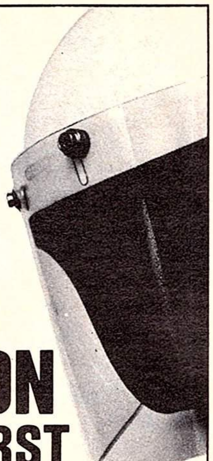
twice (once headed east, once west) Norton's refuelling operation was set up there. With my bike's six-gallon tank two fuel stops would be more than enough.

Punched out and gassed up I headed for the Lizarietta, wondering if the climb would look different from the seat of a bike than it did from the back of a car, and wondering if I would be able to muster the necessary aggression. Through a dappled forest and up a slight elevation, there it was: a red flag, the start of the climb. I remember the flag dropping and feeling inspired for the first several hundred yards, I remember going through a small courtyard and rushing up to a mercilessly narrow bridge in the middle of an impossible left-hand hairpin shrouded in weeds, and I remember the dark, rocky, streaming embankment just to the right of the corner's exit. The rest is obscured in serpentine confusion: braking points misjudged, gearshifts butchered, lines poorly read, markers forgotten, lean-angles confused, avoidable bumps hit dead-center, damp patches slid through, gravel sprayed and insult piled on humiliation heaped on ineptitude. I was awful. The Lizarietta demands an infinite succession of rapidly-made decisions; I responded with an infinite number of slowly-made wrong decisions and a time that would have embarrassed a small donkey pulling a heavy load. Everything that had gone right whistling up the Souloir went wrong staggering up Lizarietta. The climb was botched, consummately.

I still had a couple hundred miles to go, the first 15 of which were straight down the other side of the mountain and into the checkpoint at Echalar. From there the route led to Lescala and darted, bounced and twitched through the Spanish scenery to Oyarzun, which served both as a check and a normalization point. On the way I caught up with a hunkering brown bag flogging a Honda 750 that turned out to be crypto-policeman and *MotorCycle* scribe Allen Robinson, a veteran, riding easy and under control. He had passed a competitor named Heinz Finn earlier on the route. Finn had pitched his 125 Hercules into the side of a barn, and Robinson described him thus: "His bike looked like a building site, with footrests knocked off, handlebar bent skyward and both wheels buckled and out of track so that one could only suppose he was trickling into civilization to retire." Finn is that grateful, weary soul pictured at the beginning of the story. He covered 310 miles with the front end of his Hercules pointed in several directions at the same time and he finished amidst loud, long and astonished applause.

There was a third hillclimb laid on for this year's Circuit des Pyrenees. It is called the Jaizkibel, and if the Lizarietta can be characterized by treacherous low-speed corners, the Jaizkibel can be characterized by bumpy, high-speed ones. But in Oyar-



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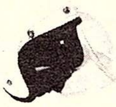

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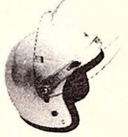

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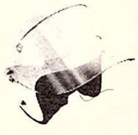

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zun we were informed that because of heavy tourist traffic coming up from San Sabastian, the road could not be closed. So the Jaizkibel, officials told us, wouldn't count as a hillclimb; it was now simply a part of the route.

Colquhoun and I set out past the wharves of San Sebastian and flung ourselves up one side of the Jaizkibel and down the other into Guadalupe, little Spanish cars coming at us like angry honking tracers. We had been freighting through the Pyrenees for over 6 hours, and the thousands and thousands of bumps, potholes and curves were beginning to take their mental toll. I found that if I marched along briskly I could build up a cushion of two to five minutes between most of the checkpoints. But riding briskly means concentrating hard, and my reflexes began to cloud coming down the Jaizkibel. I started to make little mistakes. In Guadalupe I made a big one. I had been tracking a young couple on a Lambretta scooter, stuck behind a slow-moving truck. I saw a short straight and passed the Lambretta and the truck, but had gathered too much speed for the left-hander that followed and bounded across a culvert, down a dirt path and into the weeds. I turned around and got back on the road, caught up to the Lambretta, passed it again, tipped over on the greasy Spanish asphalt and skidded to a halt in the middle of a very, very busy intersection. I broke my watch. The next time I passed the Lambretta my right footrest was gone, the front brake master cylinder was hanging on by memory and the right half of the handlebar sagged down like a politician's honor.

Without a watch I was guessing. I caught a guy on a BMW R90S. He was scooting along rapidly and looked to know what he was about, so I tagged behind him into Herboure and discovered there that I was dead on time. Espelette came up next. Nick Skinner loaned me his watch while the Norton police people fueled the bike, and from there all the way back to Pau the route was a serenade, a soft, easy cruise through Labastide Clairence and Amorots and Sauveterre, a glide through L'Hopital D'Orion and Sauvelade, Viellesegure, Lacq and Laroin and a closing gentle canter into Pau, up the hill and across the finish line. Except for an acceleration/braking test in the middle of town I was done.

We watched about thirty-five competitors return to Pau, most tired and a few bent. We marveled at Heinz Finn's little Hercules 125, so warped that it went down the road sideways like a crab, and then we went back to the hotel for a shower.

Later that evening the results were posted. I had gathered something over 240 penalty points. The winner, Paris policeman Jean Hulin on a Honda CB-500, had accumulated 22. Makes you humble.

It also makes you want to go back. ◉

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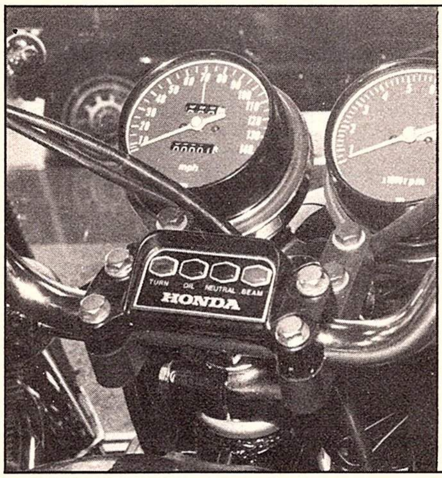

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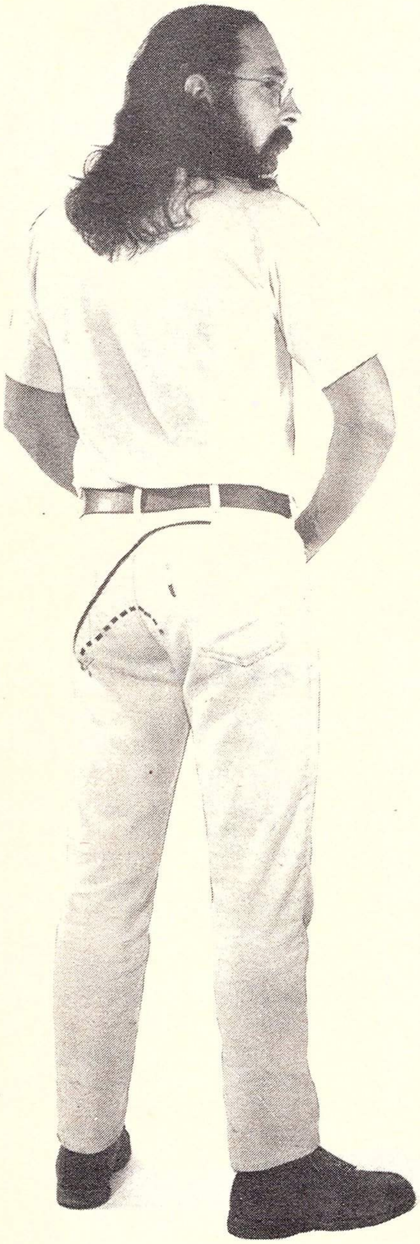

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YAMAHA DT400B *Continued from page 49*

DT360A (with the same ignition system) and two DT400Bs confirms that the starting difficulties are inherent with the Mitsubishi CDI unit.

The CDI ignition performs erratically at low engine speed. When engine revs drop suddenly to idle speed it will often just quit running—out of spark. It would seem that poor low-speed spark from the primary coil and uncontrollable action of the thyristor advance/retard action combine to rob the engine of its spark at some very embarrassing times. This symptom existed with the DT360A and DT400B.

Low speed performance of the engine is phenomenal for a bike weighted down with a full load of street legal accouterments. Because the power curve has a slight peak (rather than being absolutely flat like the Suzuki 400 Apache or XL 350), full throttle acceleration is brisk and exhilerating. Low speed and mid-range power are smooth and predictable: this eases plonking through really rough sections, driving up tough hills, or slowly grinding through muck or sand. Riding over rocks and logs forces an engine to chug on the upside and then rev suddenly when decelerating off the far side of an obstacle. In such sections where this process goes on in rapid-fire succession, the Yamaha excels. The engine's ability to grunt and pull and get its power to the ground will inspire new confidence in any novice trail riders. You'll attack hills and plow through sections you just wouldn't try on other bikes except a 400 Maico Qualifier or 340 Rokon automatic—and they cost far more than the Yamaha.

The tachometer redlines at 7000 rpm but it's futile to spin the engine past 6000. It runs best between 2000 and 5000 rpm. In this speed range the engine is producing its most useable power. And it's running at its smoothest. Because the engine doesn't have to rev fast or work hard to cover the most demanding terrain it is easy to manipulate. Less time is spent worrying about whether the transmission is in the right gear or whether the engine is revving fast enough. Therefore more rider attention can be focused on the trail or road.

The secondary gearing, taller than last year's DT360A, will probably be a shade high for most trail conditions although it's perfect for a combination of street and dirt roads. The 400 is happy cruising on the pavement at the maximum speed limit; it can run up to 70 mph quickly and effortlessly. The bike is smooth enough at 55 mph to be acceptable for all street and highway chores and even an occasional jaunt on the freeway.

The gearbox is an ideal unit for on and off-road use. Low gear is down in the basement range for controllable sub-10 mph plonking (lower yet with a smaller 13 tooth countershaft sprocket). There's a noticeable jump to second gear then even spacing up to third and through fourth. Then there is distant span to fifth gear; it's like an overdrive. The engine makes the gear ratio spacing seem unimportant because of its wide power spread.

Gearbox operation is smooth and pleasant. There aren't any glitches or gremlins causing missed shifts or false neutrals. Shifting is easiest and most precise when the clutch is used. Clutchless shifts demand that the throttle be rolled off momentarily then on again to release loading on the gear dogs. The clutches used in Yamaha enduros in recent years have been exceptionally good. They have always taken a great deal of abuse without failing or withering away from heat. This isn't the case with the DT400B. The clutch loses its adjustment when used constantly. In a couple of tough rock sections where the clutch was engaged and disengaged repeatedly, it soon lost all free play. The lever would fall back against the handlebar completely useless. It took about ten minutes cooling before the clutch regained its normal working ability. This shortcoming can be traced back to this year's change in the clutch: removing one plate and thinning the others.

The engine package is so useable that it overshadows many of the bike's faults. For most riders the comfort level of the DT400B is good. During long spells in the saddle, especially crossing rough terrain, a rider clad in cloth trousers will find himself driven forward on the seat and onto the gas tank. The rider must continually push himself back on the seat. Dressed in leathers, the rider gets virtually stuck in position thanks to a very high friction coeficient between the vinyl seat cover and cowhide.

The newly shaped gas tank has the same deficiency as previous year's Yamaha enduros—too little capacity. The average mileage for the DT400B is 30-plus mpg (under ideal conditions) and less than 25 mpg in the dirt. With a capacity of only 2.4 gallons the minimum range is down at a very short 60 miles—not enough for street or dirt. It's a shame that Yamaha went to all the trouble of redesigning a new gas tank and still made it too small.

The electrics are dependable enough but incredibly complex for a trail bike. Plan on carrying the owners manual. Or better yet, xerox the wiring diagram in the service manual. The headlight works only with the engine running while the other lights are battery operated. The turn signals are again mounted on solid steel stems securely bolted to frame bracket and handlebars. The first time we flopped the bike (inevitable with any dirt bike) the rear turn signals snapped off. Shortly thereafter the handlebar lamps put divots in our kneecaps. Rubber mounts ala the Can-Ams could eliminate these problems.

Both front and rear wheels are beefy and should never fail, but the spokes require constant attention. After every ride the spoke nipples needed up to two turns each. They never seemed to bed in. The

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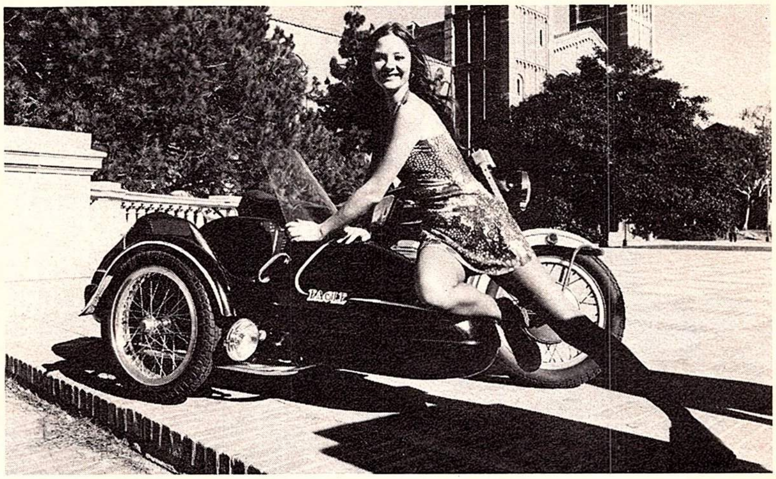

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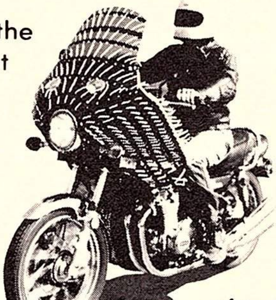
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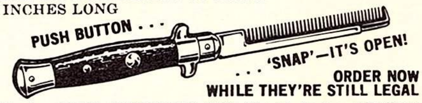

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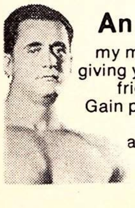

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brakes are too powerful. In the dirt they lock up the wheels at the slightest touch of the levers and adjustment fades away rapidly when they are used repeatedly.

Soft springing and light damping make the front forks nice and cushy. However the springs collapse after just a few hundred miles and require pre-loading or replacement. This year's shock springs are far too stiff for even the heaviest rider. Different springs, probably 70 to 80 ppi, would work better. The chassis works very well for street and dirt (except for the soft forks and rigid shocks). It's one of the best enduro chassis designs from Japan.

The combination of the gutsy big-bore engine and stable chassis allows the DT400B to get the power on the ground better than any other Japanese enduro bike we have ridden. With its compromise trials universal tires and tall gearing the Yamaha 400 enduro will go places in the dirt where other dual purpose bikes can't go with full knobbies. For extensive dirt riding knobbies will improve the go-anywhere capabilities of the DT400B.

As a dual-purpose machine the DT400B is a vastly better bike than the DT360A. This results almost solely from the fantastic, almost mistake-proof engine which crosses both dirt and street riding lines evenly. In the dirt it's far better than any other enduro bike from Japan. It's not as powerful and stable as the Maico 400cc Qualifier or 250cc Can-Am TNT, but it is $200 cheaper than either. On the asphalt it's more serviceable than any other dual-purpose bike regardless of origin.

With prices soaring in everyone's camp we expect that the tall $1371 price tag on the DT400B will be competitive by publication time. We are however disappointed that Yamaha hasn't corrected problem areas found in the DT360A after kicking up the price $342. The ignition-related starting and stalling problems can be corrected with a conventional points system. Trimming the clutch 21mm (.827") to gain 17mm (.67") narrower case cover won't be worth the price to an enduro rider when it fades away from a little abuse. The additional cost of making the magneto and clutch covers magnesium alloy rather than aluminum to save a few ounces is useless on a 294 pound motorcycle. Investing in a quick change rear wheel with Honda XL type axle adjusters to replace the present hodgepodge set-up would be far more valuable. Redesigning the heavy tail light and replacing the rear steel fender with a more durable plastic one could keep it from cracking off.

Trying to make a motorcycle that appeals to both riding worlds is a compromise project from the outset. Yamaha's DT400B doesn't excel as either a street scrambler or pure enduro mount. It does do both very well and if properly prepared could excel as a mid-size asphalt scratcher or enduro competitor. For the price, the DT400B remains the best all-around big-bore dirt bike in town. ◉

MIKUNI *Continued from page 43*

throttle action—with up to ¾-turn at the grip required to completely lift the slides. Stick close to stock throat size when you're doing that Mikuni conversion and you'll avoid at least this one set of problems.

Mikuni carburetors are available with either of two mountings: you can get them with the traditional two-bolt flange; they also come in spigot-type models. For the latter you'll have to pay an extra few dollars to get the matching molded neoprene stub-manifold. You'll find applications in which the flange-mount Mikuni is virtually a bolt-on replacement for an existing carburetor, and in such instances there will be an overpowering urge to go for the cheap-and-easy. Don't do it. Half the problems we have with all motorcycle carburetors can be traced to the effects of engine vibration, which causes rapid wearing of slides and needle jets, wandering idle settings, and sometimes severe frothing in the carburetors' float chambers. In fact, there's a fair chance you could approximate the good results you expect to get with a Mikuni simply by providing a little flexibility in mounting your bike's standard carburetor.

One of the "other reasons" for insisting on spigot-type carburetors will become obvious once you have begun the process of sorting out jetting, slide cutaway, etc. There may or may not be room in a four-stroke engine installation for dropping the float bowls and removing throttle slides; two-stroke engines usually carry their carburetors low, right down against the transmission housing, and there's just no hope of removing anything but the slide without first separating the Mikuni from the cylinder. If the carburetor is flange-mounted you have to take off two bolts, disturb—and perhaps tear—a manifold gasket, and worry about distorting the carburetor body if, in haste, you should overtighten the flange nuts. With the spigot-type Mikuni you loosen one Phillips-head screw to relax the neoprene sleeve's circular clamp, and presto! You're holding the carburetor in your hand, with only the throttle cable and fuel line to prevent carrying the thing right over to your work bench.

There is, unfortunately, a small problem (apart from slightly increased expense) that comes in the box with that spigot-mount Mikuni: you have to find room for the neoprene sleeve, which needs more space in every direction than a flange-mount carburetor. First, the construction of the neoprene mounting sleeve is such that the two bolts holding it in place have to be farther apart than the studs provided for most flange mountings. Second, not only do you have to provide for the neoprene stub's length, there is more distance created by the spigot extending back from the carburetor body. In some instances it will be possible to reposition the stock mounting studs; most

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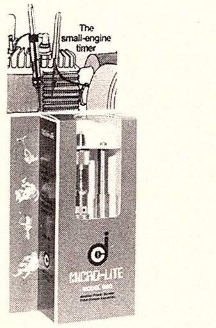

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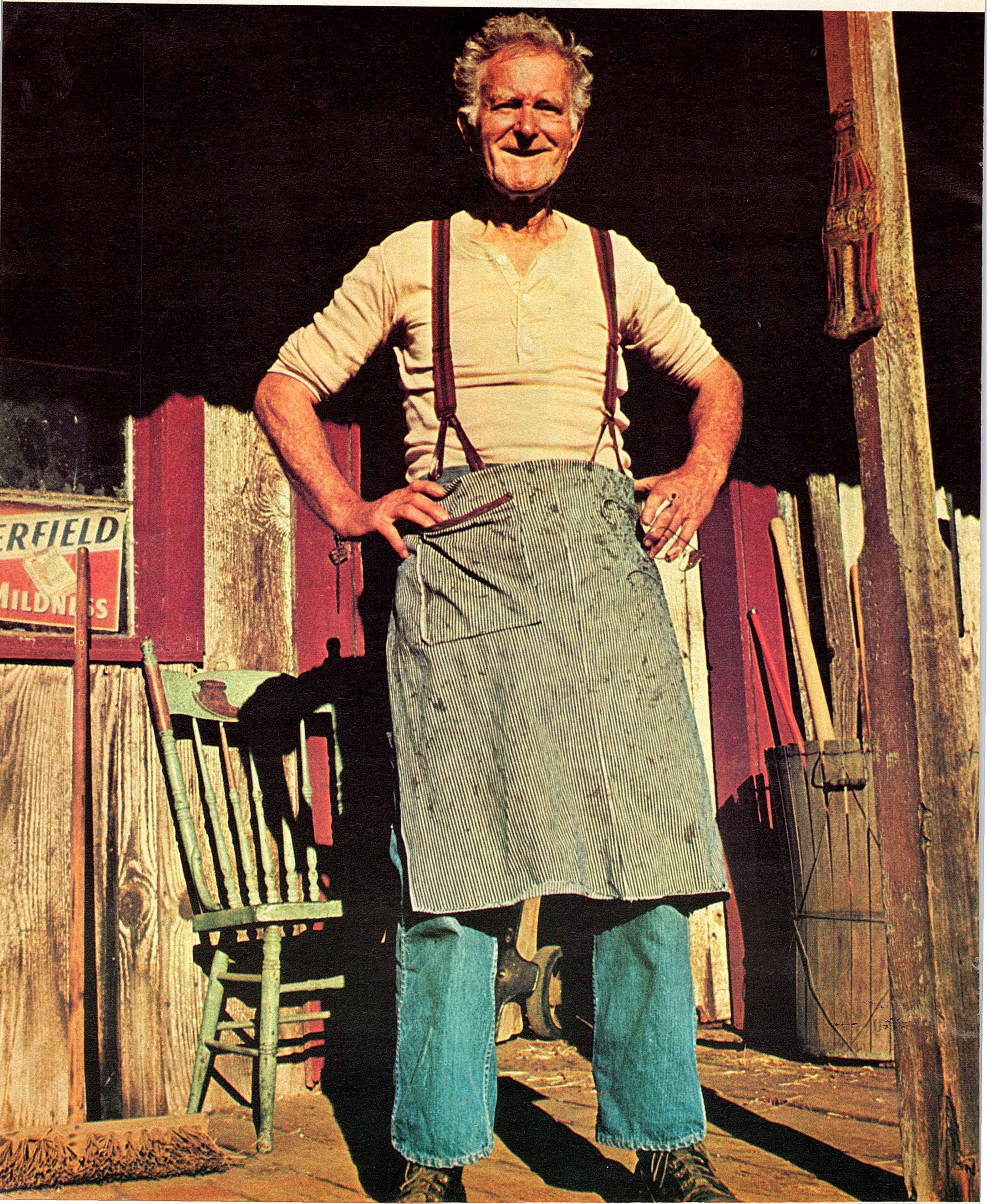


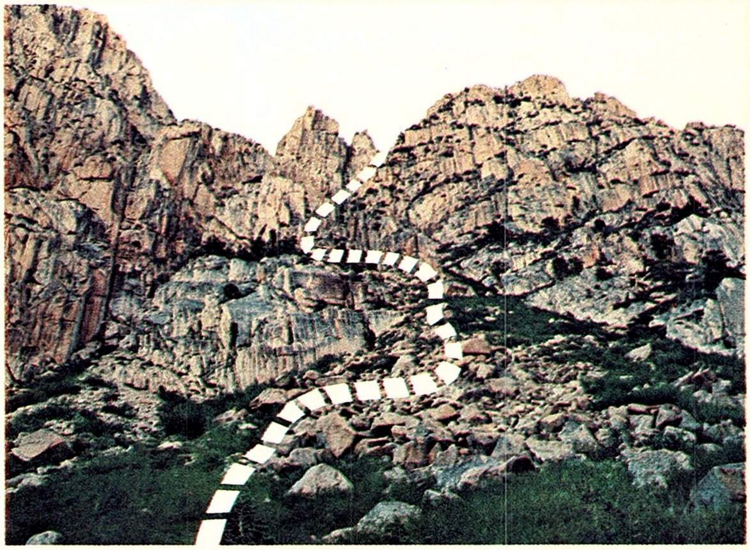
scared the hell out of me."

"I was by myself, coming back from fishing. When I see this thing, about a mile away.

"It was dropping down a gully, heading for a big pile of rocks. But it didn't run into the rocks, it glided over the top of them.

"And then it pauses for about a second and whoosh! —it climbs right straight up the side of a cliff.

"I'd never seen anything like it. So I walked down there to take a look. And that's when I got the willies. That pile of rocks was higher than a man's head. And that cliff was 30 feet, practically straight up.

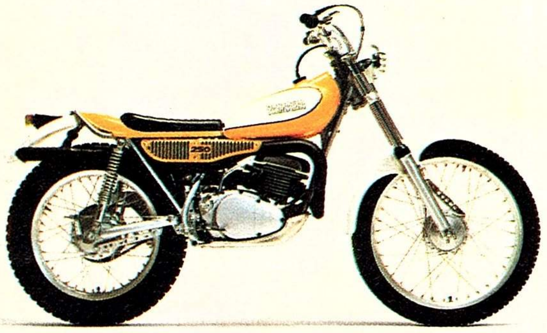


Photograph of drop-off, rock pile and cliff.

"Now keep in mind that I didn't hear a sound all this time. And I don't mind telling you it was eerie.

"Put yourself in my shoes. You see a vehicle. And you see it do things no earthly vehicle can do. What would you think? I didn't tell anybody about it for two weeks. Not even my wife.

"I know now what it was. But if I'd told what I thought it was, they'd have hauled me to County Hospital."



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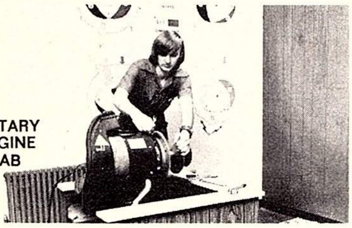

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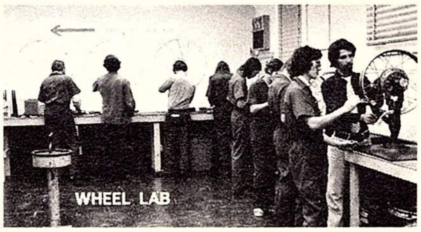

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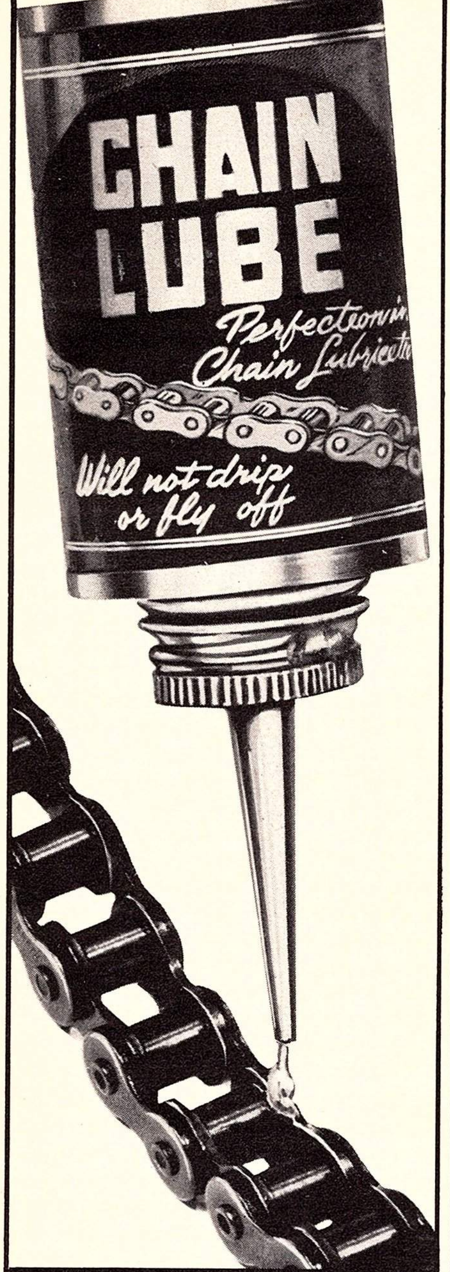
installations will require some kind of adapter, and that will add even more distance between carburetor and engine. Entirely apart from any bad effects this intake tract lengthening may have on performance, you may find yourself in difficulties because moving the carburetor back has brought it into contact with a frame member, the air box, the fuel tank's underside, or some other component that cannot easily be relocated. Such difficulties are made all the more likely by the Mikuni carburetor's size, and by the need to mount it very close to level—even if that means having its intake stuffed straight into the side of a battery. You can tilt the Mikuni a little, up or down, but if its throat is angled more than about 15-degrees from the horizontal all bets are off. We know from experience that this much will not too seriously upset the Mikuni's low-speed metering; anything more is *terra incognita* for us and what happens at 20-degrees is anybody's guess?

You can expect to have some problems in trying to devise a suitable adapter. The passageway in Mikuni's molded neoprene carburetor mounting is substantially larger in diameter than the throttle bore, and it probably will verge on overlapping the carburetor mounting studs on your engine. So you cannot simply bolt a plate to the existing studs and then mount the neoprene sleeve on the plate, as the studs and their nuts would have to be recessed into the plate to keep them from fouling the sleeve, and doing that would mean that air could leak inward past the sleeve flange, using the recesses as passages. An alternative is to make up an adapter that is a short piece of tubing with a flange at each end. One flange would fit the existing studs; the other would match the Mikuni sleeve. This last approach can work very well in four-stroke engine applications, where an extra couple of inches in intake tract length probably would serve only to move the power peak downward slightly and improve midrange performance. But two-stroke engines won't like the extra length at all, and there may not be room within the frame even if the engine has no objections.

All things considered, probably the best solution to the adapter problem is to use quarter-inch aluminum plate and countersunk screws. If the countersinking is done carefully the screw heads will be flush with the plate surfaces, with only the screwdriver slots to interfere with an air-tight seal. A liberal application of Permatex takes care of that last problem. You may have some trouble finding countersunk screws with threads matching those of the engine's original carburetor mounting studs, but this may be overcome by either re-tapping the stud holes or making a special set of countersunk screws. That will take care of fixing the adapter to the engine. You can then use a pair of allen-head screws to secure the neoprene sleeve's flange to the adapter plate, run-



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ning them into threaded holes in the aluminum. However, you must take care that the screws are exactly the right length, because if they're too short they may pull the threads out of the aluminum—which is too thin to offer more than minimal support even when used to maximum advantage—and if the screws are too long they'll bottom against the metal behind the adapter.

A few engines have intake manifolds separate from their cylinder or cylinder-head castings, and this arrangement eases the adapter difficulty enormously. If the manifold is made of steel you saw away the existing carburetor flange and weld on a replacement with a hole pattern to match the Mikuni mounting sleeve. Heli-arc welding equipment is required to do the same thing to an aluminum manifold, and that kind of service may not be available everywhere. Where only ordinary gas-welding can be done you can effectively reproduce the aluminum manifold in steel, with the appropriate hole pattern in the outer manifold flange.

If all this fabricating and modifying seems intimidating, here's a piece of information that will lend confidence: apart from the matter of getting those countersunk screw heads flush with the adapter plate, nothing has to be done with much precision. All the bolt holes can be a bit sloppy and the adapter plate surfaces none-too-smooth, and a good slathering of Permatex will fix everything. It isn't even necessary to get the port/carburetor/adapter alignment especially close. There's a big change in passage cross-section where the carburetor plugs into the neoprene sleeve, and you can't do much to correct that. Just make the hole through the adapter smaller than the hole through the sleeve, larger than the port apperture, and don't worry about alignment. Air will flow past the close-spaced, abrupt reductions in diameter just like they were covered with a streamlined bell, and if the reductions are displaced laterally a sixteenth-inch or so you merely will have created a slightly bent bell. There really is no point in expending a lot of time and energy smoothing the sleeve/adapter/port transition when you have, say, a 32mm throttle bore plugged into a 38mm-inside sleeve diameter. That abrupt discontinuity will set up a turbulence that is certain to persist clear past the intake valve.

We have already noted that Mikuni carburetors are bulky, compared with others of the same throat diameter. They also have a comparatively enormous intake bell, or to be more precise an enormous ring around the intake bell. This ring is so large, in fact, that when the hose connecting carburetor and air cleaner is kept reasonably short the intake tract, from the standpoint of tuned length, ends at the carburetor mouth. With a smaller connection the hose would act as an extension to the intake tract, and carry the strong intake pulsations forward to envelop the

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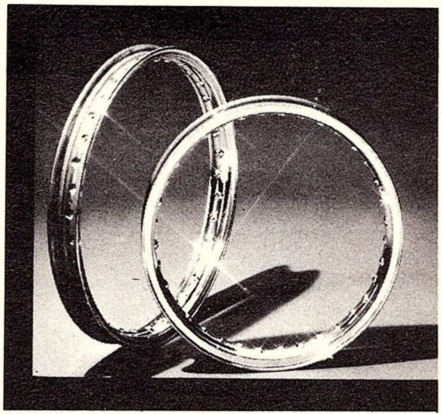

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carburetor's fuel delivery orifices. The pulses have ample strength to seriously compromise fuel metering—to the extent of halting all fuel flow when conditions produce a standing positive wave over the spray nozzle. The Mikuni's oversize entry ring forces the use of air cleaner hose of such diameter that it cannot act as a part of the intake tract. Also the hose's cross-sectional area is so great that it won't develop secondary resonances of any appreciable amplitude unless you make the unlikely mistake of providing it with considerable length. As long as the carburetor/air cleaner connection hose's length is no more than six of its diameters, any sonic wave activity in the hose should be so high in frequency and low in amplitude that no problems will arise.

Whatever you do with the connecting hose, do not fail to provide a good air cleaner. There's a lot of grit whipped up by traffic along paved roads, and the off-road motorcycle lives in clouds of dust—which means *all* bikes require an air filtration system. You may be lucky, and find that you can use the stock air cleaner on your bike; more often than not the system will have to be modified, in ways ranging from a simple rearranging of the carburetor/air cleaner connection right out to total replacement. If replacement looks like the only solution, you're going to spend a little money, but escape doing any real work. There are lots of suitable air filters available: the plastic foam socks have to be oiled, and that makes them messy, but they fit almost anywhere, flow plenty of air, and are inexpensive; have a look, too, at the neat air filters in the K&N catalogue.

You'll have to do something about fuel filtering when making the conversion to Mikuni. All Japanese-made motorcycles have sediment traps built into their fuel valves, so Mikuni has not bothered to provide what they probably see as redundant filtering in the carburetors. Happily, there are in-line fuel filters, modest in both size and price, to be found at almost any automotive supplies store.

Before you get past the final stage of converting over to a Mikuni carburetor, you'll have a fine opportunity to discover exactly how much fortitude in the face of unspeakable frustration you really possess. The final stage also may turn out to be a testing of your bank account, because after you have the carburetor firmly in place, fuel lines connected, air filtration provided, throttle working and all the rest, then you'll begin the really important work—which is to find a combination of jets, slide and needle that actually produces that wonderful performance and mileage legend promises.

Where do you begin? Most people begin with a mistake: to think that carburetor tuning is a matter of finding the right main jet, and that notion is just awesomely wrong. You really begin with the carburetor's pilot jet, and you may have to return to that one a number of times as the tuning process advances. According to most literature on the subject, all the motorcycle carburetor's functions are neatly divided: the pilot jet takes care of the idle mixture, and then ceases to make any difference after the throttle is more than ⅛ open; then the throttle slide cutaway is supposed to take over, determining how much fuel gets pulled up from the spray nozzle from ⅛ to ¼ throttle openings; from ¼ to ¾ throttle, fuel metering is said to be handled by the tapered needle that partially blocks the needle jet; and from ¾ to full throttle we theoretically rely on the main jet alone. In reality, as the various fuel flow/throttle opening charts provided with this text will show, there is a considerable and confusing overlapping of effects: the pilot jet quickly reaches maximum flow as the throttle is cracked open, but its flow is superimposed on all the others and a change will be felt throughout the range; the effects of slide cutaway extend from idle almost to full throttle; the needle jet will, if its size is right, strongly influence the mixture strength from idle to half-throttle, and have some effect up to the 75-percent point; the tapered jet needle works all the way; and changes in main jet will change fuel flow from a little less than half to wide-open throttle. It's a very subtle blending of functions, and it is distinctly possible to have more than one combination producing nearly identical results.

We have observed that Mikuni carburetors are sold with standard jetting, etc., to suit an average situation, and people who do not depart too drastically from the average can get away with simply bolting their new carburetor in place and fiddling with main jets until the engine runs satisfactorily. That is to say, holding to that near-standard throat size so often recommended here will pretty nearly guarantee acceptable results. Acceptable, but not outstanding. If you want really sharp running you'll have to experiment, and you begin with that pilot jet mentioned earlier.

How do you know when the pilot jet is right? That's easy: if, when you have adjusted the idle mixture and throttle-stop screws to give the best idle with the least throttle opening, you have the mixture screw turned out from its seat about 1½ turns, then the pilot jet is perfect. The range is from one turn to three turns. If you get the best idle at less than a turn the pilot jet is too small; more than three turns and it's too large.

Past ⅛-throttle the pilot jet is doing all it will, and you then have to start juggling needles, needle jets and slide cutaways. In this, the fuel flow charts are invaluable, as are your own powers of observation. It sometimes is very difficult to know whether a slight raggedness in the engine's running is the result of a too-lean mixture, or one that is overly rich. However, in general it may be said that the difference

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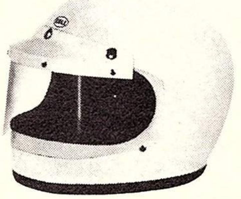

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is revealed in the engine's response to a little more throttle, quickly applied. If the condition is made worse for an instant, the engine stumbling, then the mixture is too lean. But if the raggedness is most pronounced during steady-state cruising and improves with the application of more throttle, you then need to get rid of a too-rich condition.

The charts are a big help, but only if you actually know the exact throttle opening. One conceivably might leave off the air cleaners and actually peer inside the carburetor throats; that probably isn't practical in the real world of roadside posts, oncoming traffic and the like. A better method is to rig a drum and pointer at the throttle twist grip, with the drum indexed for slide position (the marking should be in eighth-throttle increments) and the pointer placed to give readings free of parallax error. And if you have a big-displacement motorcycle you'll be amazed at the amount of time you spend riding at no more than ¼ throttle. My own bike, a 750, will run right past the legal speed limit with a little less than quarter throttle, and cranking up another quarter takes it over 90 mph. All of this means that the pilot jet, needle jet, needle and slide cutaway really are much more important than the main jet.

Ordering alternative parts for Mikunis requires that you know the numbering system, which is in most respects uncomplicated. Slide cutaway is higher when the number is higher: a 3.5 slide has a higher cutaway than one carrying a 3.0 marking; higher cutaways produce a leaner mixture. Main and pilot jets' numbers get higher as the jet orifices get bigger, for a richer mixture. The air jet in the small passage leading to the needle jet also is bigger at the higher numbers, but the effect is reversed: bigger air jets lean the mixture—especially at high engine speeds. You shouldn't have to change this compensating air jet unless you're trying to correct for a high speed leanness and can't do it with main jetting without creating a mid-range, wide open throttle richness. The needle jet code is a combination of letters and numbers indicating orifice diameter, all of which is explained by the appropriate chart presented here.

Needle Jet Inside Diameter

	0	1	2	3		9
N	2.550	2.555	2.560	2.565	—	2.595
O	2.600	2.605	2.610	2.615	—	2.645
P	2.650	2.655	2.660	2.665	—	2.695
Q	2.700	2.705	2.710	2.715	—	2.745

That leaves the tapered metering needle, which works with the needle jet to form a variable area orifice controlling fuel flow up from the main jet. The needles are stamped with a number/letter designation like, "6DH4", which—starting at the beginning and working through—means the following: the number 6 is the code for needle length, in this case telling

LETTERS *Continued from page 16*

THE DRY TASTE

Having just been introduced to your magazine, I find it to be one of the most informative publications which I have read on the subject of motorcycles and motorcycling. The "Basics" article on ignitions in the August issue was highly enlightening and cleared up many questions. Being a newcomer to the sport of motorcycling, I appreciated the depth and clarity of such articles as "The Shop: Magic Toolbox" (Aug. 74), and your road tests. Editorials used to be well-cut and dry to the taste, but you have given them a new life as interesting and informative parts of the whole picture of the status of riders and bikes. Keep up the good work in the field as well as at the desks.

Charles J. Meyer
Buffalo, N.Y.

GETTING BETTER

I've written several nasty letters to *Cycle* Magazine in the past three years. It all started in 1971 with the 250 Enduro comparison test, which I felt was highly unfair to the European bikes.

In the past several issues, however, you've come through with some fine unbiased articles on European as well as Japanese dirt bikes. I've truly enjoyed your tests on the Maico 450, Kawasaki 125 and 175, Yamaha YZ, Can Am 175, Penton 250, Montesa VR, and Maico Qualifier.

You are the first magazine to explain to me why Maico's front end is so precise, and how the tiny Maico transmission is able to survive. By taking the time to disassemble the various engines, you've given your readers valuable information with which to compare the motorcycles.

I still disagree with that 1971 250 Enduro comparison, but I'd like to see one on the 1974 Enduro bikes.

Michael Bresler
Santa Clara, CA.

A SCHNEIDERS FAN

That article on "Keeping Time" in enduros was fantastic. It was good and long, and it told every side of an enduro rider's timekeeping procedures. I was really pleased.

I was thinking about entering an enduro for a while but know I'm sure going to do it, after reading that great article.

Raymond Burkett
Middletown, PA.

KEEPING TIME

Wow! Thanks for the *Super* article on Enduro Timekeeping. More!

Bill Seully
Decatur, GA.

(Continued on page 112)

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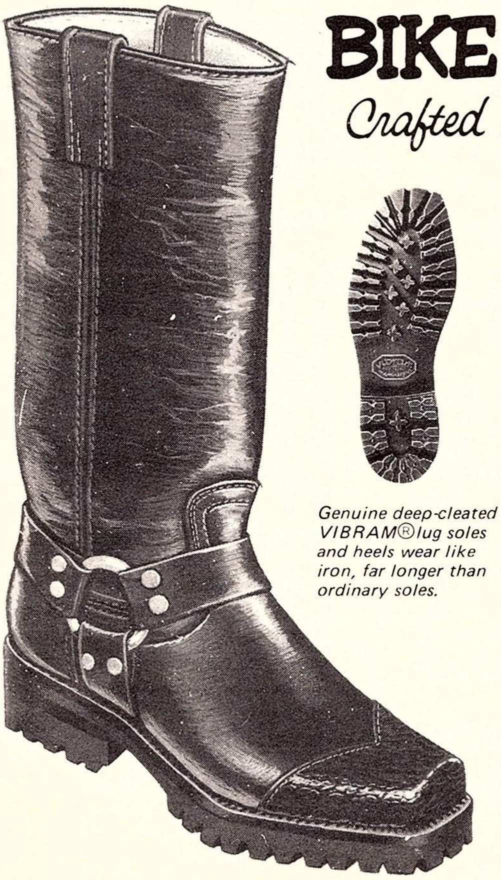

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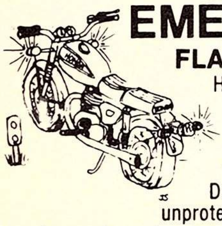

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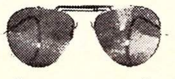

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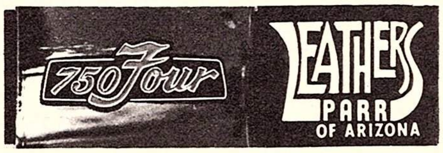

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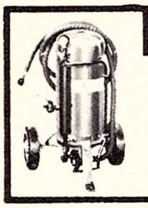

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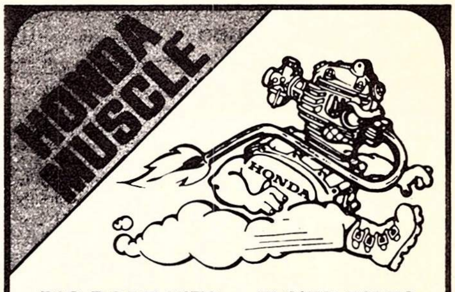

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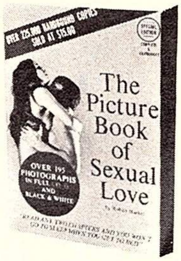
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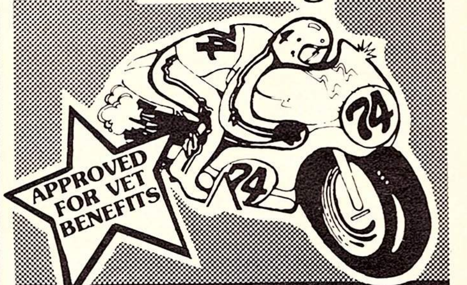

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MIKUNI *Continued from page 104.*

us it is for a 60mm reach; the letters are for the needle's tapers, and there is 0.25-degree per letter as you progress through the alphabet so this hypothetical needle has a first, upper taper of 1.0-degree and a second, lower taper of 2.0-degrees. Then we come to the last number, and it's the one that will drive you quietly crazy because it is assigned arbitrarily. What it signifies is the fact that not all the tapers begin at the same place along the needle's length, and that some needles have a slight reduction in diameter just above the first taper. But the number serves only to keep Mikuni's engineering records straight; it does not indicate any orderly progression.

Neither does the information provided here insure that the carburetor tuning you eventually may do will follow an orderly progression. All we can do is to supply guidance, in the most general way. In the end it is a matter of trial and error, with plenty of error. My own experience included the discovery of one needle jet and needle combination that made my bike's engine absolutely refuse to run. It would start and idle, but cough and expire at the slightest opening of the throttle. But in fairness to Mikuni it must be said that this impasse was reached more or less deliberately in the course of investigative experiment. The Mikuni carburetors I used actually worked pretty well, right off the shelf. The performance gain was unmistakable, the engine ran cleanly at nearly all throttle openings—with just a little over-rich surging between ⅛ and ¼ throttle, which was easily corrected by changing the pilot jet, needle jet, needle and slide cutaway about twenty times. As matters now stand the bike runs without any overt rich/lean symptoms, but I know it's still too rich right off idle because it runs a little too willingly when cold, and the plugs tell me the mid-range mixture is a trifle lean. So the tuning process goes on, and seems certain to continue for maybe the next six months—at which time the collection of carburetor internals that didn't work quite right will be worth probably twice the cost of the carburetors themselves.

One of your expenses should be the Mikuni VM Carburetor Super Tuning Manual, which is available from the Mikuni K. America Corporation, 7923 Gloria Avenue, Van Nuys, California 91406. The manual will be a big help when you're right down there in all the jets and stuff, wondering what to do, and if you get stuck call (213) 781-5060, or 873-7880 to pester the Mikuni people personally. Don't tell them we told you where to call, because they probably are going to have their phones ringing themselves off the hook. After the first hundred replies to callers who want to know which one of those funny-looking pieces of brass is the pilot jet the Mikuni guys may wish they'd never heard of *Cycle*. And don't call us because we don't know a thing that isn't in the Mikuni manual or this text. ◉

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EXPIRES DECEMBER 28, 1974 CC 11/74 1

Name ______________________

Address ______________________

City ______________ State ______________ Zip Code ________

PLEASE ANSWER ALL QUESTIONS BELOW AND TYPE OR PRINT AS CLEARLY AS POSSIBLE

1. How many motorcycles do you now own?
A ☐ 1 B ☐ 2 C ☐ 3 or more D ☐ None

FOR MOTORCYCLES CURRENTLY OWNED, PLEASE COMPLETE THE FOLLOWING:

Answer for most recent purchase if more than one is owned.

2. What make?
A ☐ BSA D ☐ H-D G ☐ Kawasaki J ☐ Suzuki
B ☐ BMW E ☐ Hodaka H ☐ Norton K ☐ Triumph
C ☐ Bultaco F ☐ Honda I ☐ Ossa L ☐ Yamaha
M ☐ Other

3. What engine size?
A ☐ 40-99cc D ☐ 300-399cc G ☐ 600-699cc
B ☐ 100-199cc E ☐ 400-499cc H ☐ 700-799cc
C ☐ 200-299cc F ☐ 500-599cc J ☐ 800cc & up

4. Excluding motorcycle(s) currently owned, had you previously owned a motorcycle? 1 ☐ Yes 2 ☐ No

If YES:

5. What make? (Most recently owned, if more than one.)
A ☐ BSA D ☐ H-D G ☐ Kawasaki K ☐ Suzuki
B ☐ BMW E ☐ Hodaka H ☐ Norton L ☐ Triumph
C ☐ Bultaco F ☐ Honda J ☐ Ossa M ☐ Yamaha
N ☐ Other

6. What engine size? (Most recently owned, if more than one.)
1 ☐ 40-99cc 4 ☐ 300-399cc 7 ☐ 600-699cc
2 ☐ 100-199cc 5 ☐ 400-499cc 8 ☐ 700-799cc
3 ☐ 200-299cc 6 ☐ 500-599cc 9 ☐ 800cc & up

7. Do you plan to buy a new motorcycle within the next 12 months?
A ☐ Yes B ☐ No

If YES:

8. What make are you most seriously considering? (Check ONE.)
A ☐ BSA D ☐ H-D G ☐ Kawasaki J ☐ Suzuki
B ☐ BMW E ☐ Hodaka H ☐ Norton K ☐ Triumph
C ☐ Bultaco F ☐ Honda I ☐ Ossa L ☐ Yamaha
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B ☐ 100-199cc E ☐ 400-499cc H ☐ 700-799cc
C ☐ 200-299cc F ☐ 500-599cc J ☐ 800cc & up

10. How much do you plan to spend on motorcycle *accessories* (e.g. protective clothing, goggles, special instruments, tools, mirrors, etc.) within the next 12 months?
1 ☐ Less than $30 3 ☐ $50-$59 5 ☐ $100-$149 7 ☐ $200-$299
2 ☐ $30-$49 4 ☐ $60-$99 6 ☐ $150-$199 8 ☐ $300 or more

11. What is your age?
A ☐ Under 18 C ☐ 21 - 24 E ☐ 35 - 44 G ☐ 55 - 64
B ☐ 18 - 20 D ☐ 25 - 34 F ☐ 45 - 54 H ☐ 65 or over

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91	92	93	94	95	96	97	98	99	100					

LETTERS

Continued from page 105

BLOW TORCH

Some months ago, I read with interest your Editorial, "The Big Burn." It seems like the heat gets a little worse every time I have to visit my friendly neighborhood dealer.

A short time ago, after a minor wipeout, I was told by the parts man that a brake lever for my Harley Sprint was priced at $8.40. For one! Mercifully, my mind went numb at that instant, so I missed most of his rap about his problems concerning supply and everything going up, etc.

My gut reaction was to slide the lever back across the counter, but things being what they are (a lever is needed if one is to stop his motorcycle), I coughed up the bread.

On my way out, passing one of the owners, I held the lever up for his scrutiny, intoning "Eight dollars, how?" He assured me that he was as astonished as I. "It really is amazing," he smiled. He ought to know; he's the man behind the blowtorch.

I also own a Velocette and a Matchless twin, but if this kind of piracy continues, I'm getting a Chevelle.

Ken Grosso
No address

NEXT ACT

According to a recent article in the September, '74 issue of CYCLE you stated that the BMW R-90S would leave a Z1 Kawasaki in any throttle roll-on contest in any gear. If so, why do you state in the June, '74 issue that the "Z1 is faster than the BMW R-90S any way you slice it"?

Not to be sarcastic, but what do you do for your next act?

Richard S. Bird
Arlington, Mass.

The problem comes with determining what in fact constitutes the real world. The best stock Z-1 we've ever tested recorded a 12.3—110.7 mph quarter. Other Zs have gunned up 12.5s and 12.6s at will, with terminal speeds in excess of 105–106 mph. The BMW R90/S ran in the low, low 13s at speeds in the neighborhood of 102 mph. Which of the two bikes is clearly the fastest and quickest in the quarter? The Z-1, by more than a half-second and 3 mph.

But: the R90/S will do it to a Z-1 in a rolling-start acceleration contest, time after time, any gear, any engine speed. Which is the faster of the two motorcycles? The BMW, emphatically. What constitutes the real world? The street, with no timing apparatus and two different riders? Or the drag strip, where the bikes are asked to deliver performance that they are not asked for on the street? We picked the drag strip as the lesser of the two evils. Shoddy as it is, that's our explanation. We have no clear reason for the difference in drag strip numbers and street performance, except to take a guess that the Z-1 is asked to perform, in a roll-on, at engine speeds way below its peak, and note that the weight differential between the two emphatically favors the BMW, and to postulate (we have no dyno figures on the BMW because of its shaft drive) that the R90/S delivers more torque below 6000 rpm than does the 903 Z-1.—Ed.

Useless

When I first started reading and buying your magazine I thought it was one of the best. However, since I got my subscription to your magazine your biased and distorted views have made me sorry that I did. It is very obvious that the adage "the man that pays the piper calls the tune" is what is hampering the excellent writers that your magazine employs.

Exactly what I mean is this: it is obvious that since Honda is doing so much advertising in your magazine that you are favorably biased toward their machines. This bias does not extend just to the extent of praising their garbage but to the point where you put down other bikes. One example of this is your test on the YZ 250 Yamaha. You said that the front end plows. Other magazines such as Dirt Bike, Cycle Guide and Motorcyclist failed to notice this, and if the front end on a bike plows to the extent that you say, then the other magazines would have said that it should have been a tractor; but they say that handling is good.

Another example of this bias is your test of the Honda 360G. If I remember correctly, you rated it as an all around good machine while other magazines say that it's useless.

It is this bias which made me decide to let my subscription run out. I shall continue to purchase your magazine off the newsstand from time to time so that when the man that pays the piper lets the piper play what he wants to play, I will know, and at that time will renew my subscription to your otherwise excellent magazine.

H.G. Hill
Boulder, Colo.

Not that it's going to make any difference, Mr. Hill, but through our July issue Honda had purchased 26½ pages of advertising, Kawasaki 17, Yamaha 27 and Suzuki 27.

HUMAN PERSON

Upon the arival of the Sept. 1974 issue of *Cycle*, I cannot wait any longer to express my deep compliments to writers Gordon Jennings and Kevin Cameron. My special interest is engineering and roadracing, and their articles express this art to me so very well.

I have followed Jennings since the mid-60s during his Bridgestone racer project, and could feel the frustrations and joys Jennings surely felt. His motorcycle engineering knowledge coupled with (subtle?) tongue-in-cheek approach to failures in engineering experiments, make him to me such a complete human person.

I like Kevin Cameron because when he describes a race or racer, one feels he is there peering into engine ports of factory or non-factory racers. His articles make me feel Nixon's Suzuki pulled past Roberts Yamaha on the straight because Erv had installed the "high-rpm" cylinders. I felt tired and discouraged with Cameron's account of Cliff Car when he did not come around again at Ontario, and how cracked crank bearing racers were the downfall of a near-successful private effort.

If you do not have room or time for the above, just say for me to Gordon Jennings and Kevin Cameron that their writings make motorcycle engineering and national roadracing a joy to read and experience.

Maurice D. McCoy Jr.
Martinsville, Ill.

We always have room and time for the above.—Ed.

GARDEN STATE PARKWAY

I have just had an opportunity to read the August issue of *Cycle*. On behalf of the AMA staff and the members of the Association, I want to thank you for the outstanding Editorial this month. I think it is very important for motorcyclists throughout the country to know about this outstanding victory, and I'm glad they have the opportunity to read the full story in the industry's biggest magazine.

Ed Youngblood
General Manager
American Motorcycle Assoc.

Does this mean we're friends?—Ed.

SURVEY

In a two-year study on all 'motorcycle accidents' that entered this six hundred bed hospital, 78% were under the age of 25.

% of Accidents on size of Cycle

0–350cc	56%	
351–650cc	21%	(Road Bikes Only)
651–1000cc	11%	
over 1000cc	2%	

Motorcycle-Auto Accidents
Auto Fault = 81% (Road
M/C Fault = 19% Bikes Only)

Emergency Room Cases
Off Road Bikes = 67%
Road Bikes = 33%

Admitted to Hospital
Off Road Bikes = 8%
Road Bikes = 27%

Deaths
Off Road Bikes = Less than 1%
Road Bikes = 7%

Accidents Happened
In City = 76% (Road
Out of City = 24% Bikes Only)

Robert P. Bear
York Hospital
York, PA.

Address all correspondence to: Cook Neilson, "Letters," CYCLE Magazine, 780-A Lakefield Road, Westlake Village, California, 91361.

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